SEPTEMBER 1956

plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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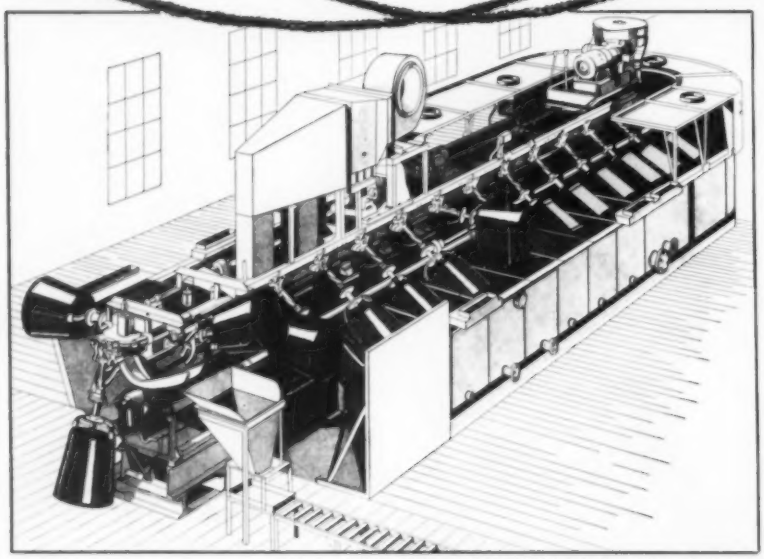

End View of Stevens Super "E" Automatic Barrel Plating Machine.

Since Stevens first introduced the Automatic Barrel machine scores of industries have enjoyed these operational advantages. Check them against your present operations.

MINIMUM LABOR REQUIRED — In most cases, one unskilled employee can operate the machine.

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View of Stevens Experimental Laboratory

Yes, if you want to increase your sales with the right "cut" for your product, contact Stevens. Write today for more details. *Frederic B. Stevens, Inc., 1801 Eighteenth Street, Detroit 16, Michigan.*

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Your Metal Finishing Supermarket
DETROIT 16, MICHIGAN

An Educational Society for the Advancement of the Science of Electroplating, the Finishing of Metals and Allied Arts

plating

Journal of the American Electroplaters' Society

September 1956 **Vol. 43, No. 9**

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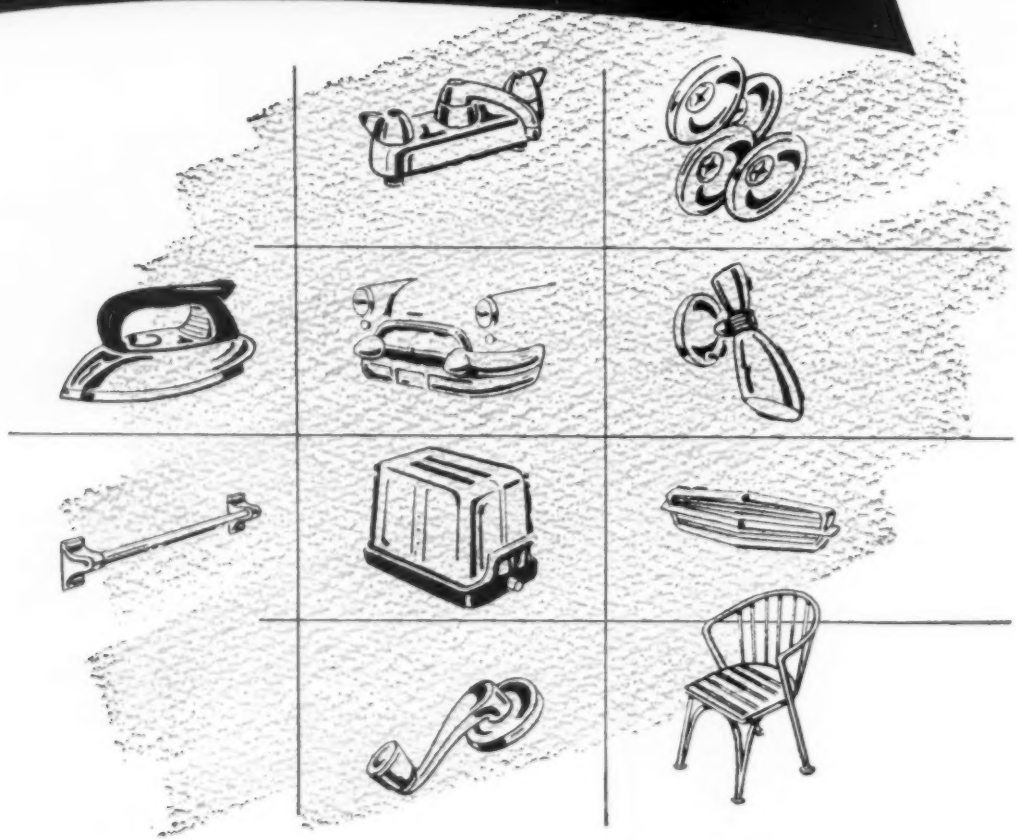
SOCIETY of BUSINESS MAGAZINE EDITORS

HARSHAW Nubrite

long, bright nickel plating operation without treatment



Other outstanding advantages are:

BRIGHT OVER WIDE RANGE
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HIGH TOLERANCE to common impurities

HIGHLY RECEPTIVE to chrome

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BETTER BRIGHTNESS with thinner deposits.

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Plates brightly from 120°F to 155°F.
pH can vary over a wide range
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EDITORIAL

PLATING KNOWLEDGE—AND YOU

The other day I was talking with a friend who is a long-time member of AES and I asked him why he didn't get to Branch meetings any more. Boiled down, his reply was that he didn't seem to learn as much of value as he used to years ago.

This problem is very common and it is readily explained. My friend is an established business man; he owns his own shop in a highly specialized plating field. His needs technically are ones which probably he, with his highly skilled help, can solve alone. Over the years of toil and experience, he has become self-sufficient to a large degree.

A wonderful opportunity was presented by this incident to emphasize the educational necessities of our Society. Here is a man who has changed from a seeker of information to a giver of information. He is now at the stage where his knowledge of plating is required to help those younger get their start just as he did some years back. His attendance at Branch meetings is his obligation to the young fellows and AES.

Plating education is everybody's job! The Plating School instructor, the College and University professor; the Plating magazine author, the Branch Librarian, the Branch Speaker, the tank man and, yes, especially the seasoned plater with his horde of practical experience—these are the people who are the prime educators of our Society.

Are you taking advantage of your opportunities to learn and to teach? The American Electroplaters' Society needs you in its educational program.

Francis T. Eddy

First Vice-President

"RELIANCE" PRODUCTS

EFFICIENT • EFFECTIVE • DEPENDABLE

At no charge, our Engineering Department is always glad to make recommendations and help solve your polishing and/or plating problems

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BENCH OR FLOOR MODELS

100 TO 5000 AMP OUTPUT

VOLTAGE RANGES
0- 6
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0-12
0-15
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0-24

REMOTE CONTROL AT SMALL EXTRA COST

For that tough cutting down job on steel or stainless steel, solve your problem with

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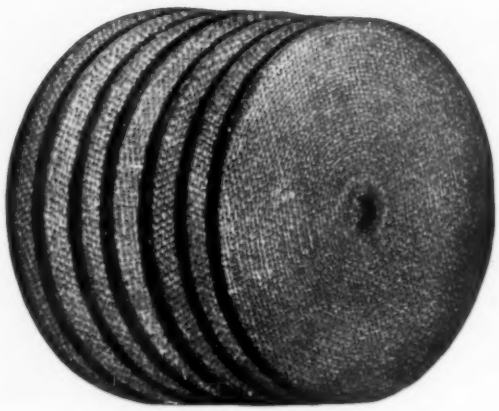

Specially treated:

For cooler operation—

For longer life by binding the fibres together to prevent fraying—

For better compound adherence—

To cut faster and bring up a high finish

RELIANCE matching compositions furnished in either molded cakes, or extruded to your specifications.

Chas. F. L'Hommedieu & Sons Co.

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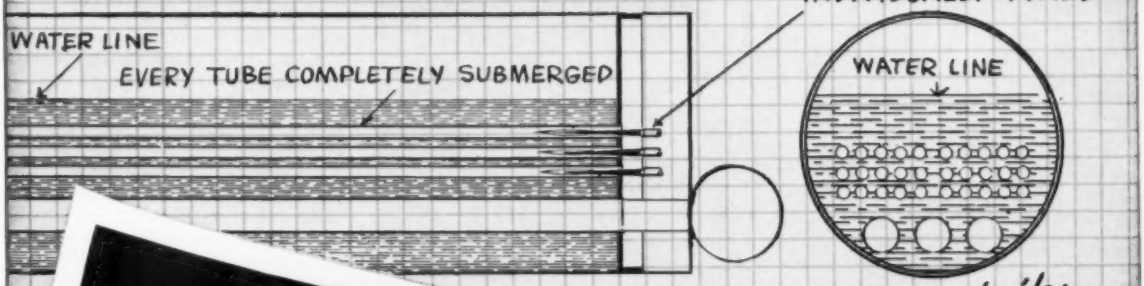
when you buy a steam boiler . . . be sure to look at the picture of a Sellers Immersion Boiler



There's no other boiler like a Sellers—

every square foot of heating surface is water backed— —100% effective!

The long, individually gas fired tubes in the Sellers Immersion Boiler are all completely submerged nearer the water level—and over the return tubes! Heat is therefore uniformly distributed through them—and directly into the water—no where else!

there's no scale problem!

In immersion heating, the needed long tubes expand and contract sufficiently on intermittent firing to crack loose any hard scale that forms on the tubes. This practically eliminates the scale problem, makes maintenance simpler and increases the boiler's efficiency.

the average flue gas travel is 15 feet!

Maximum, almost complete utilization of the exhaust heat is assured with a Sellers Immersion Boiler. This is a result of Sellers exclusive design—with the firing tubes completely submerged and *located over the return tubes*, there is a long, slow flue gas travel—an average of 15 feet! Heat can only go into the water.

There's no other steam boiler like a Sellers Immersion Steam Boiler. Its simple design gives you a package boiler unit with many other outstanding features. Minimum maintenance and maximum efficiency combine to give you years of remarkably low operating costs. Twelve sizes available!

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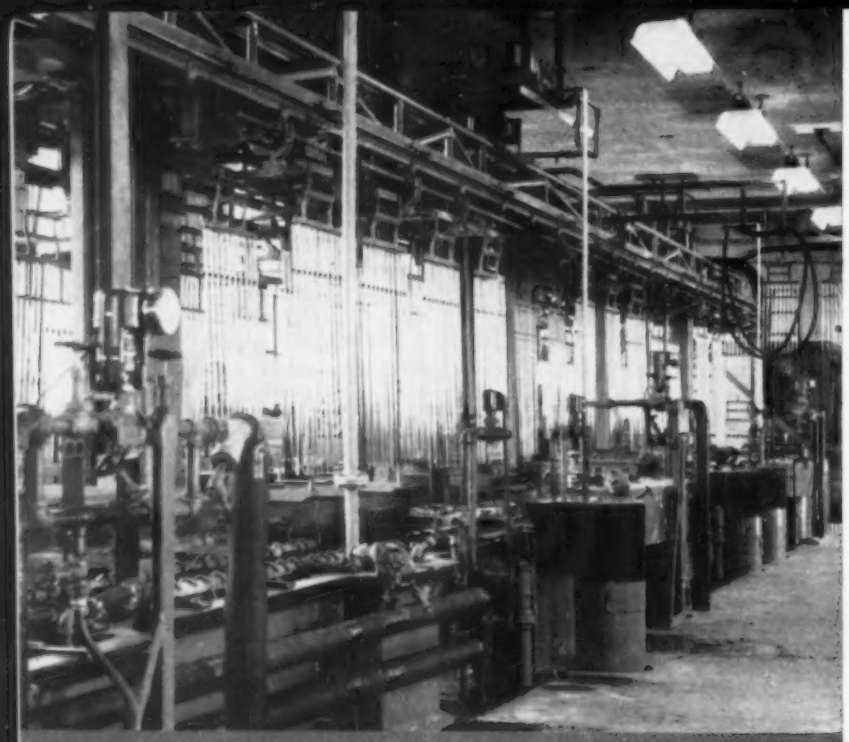
Your letterhead will bring you this tell all, dollar saving story on all 12 sizes.

Sellers ENGINEERING CO.

4876 N. CLARK STREET CHICAGO, ILL.

Blast Heaters • Immersion Automatic Water Heaters • Combustion Units • Industrial Gas Burners
Vertical Steam Boilers • Immersion Tank Heaters • Gas Combustion Equipment



PLATING 2000 GOLF SHAFTS AN HOUR ON THE UDYLITE FULL AUTOMATIC

True Temper Profits with Plating Precision

Smooth operation of the Udylite Full Automatic machine has made the big difference in the nickel and chrome plating of golf shafts. The rejections due to plating defects are negligible as positive automatic action eliminated the constant hazards of hand operations.

The regulated speed of lift allows sufficient time for drainage resulting in saving some 50% of the plating solutions formerly lost—a considerable reduction in the use of nickel and chromic acid.

Plate deposit is controlled very closely—this equipment produces 2000 pieces per hour all with a fine degree of uniformity. The variable speeds of the machine itself permit True Temper to predetermine and maintain the plate deposit without changing the time or efficiency of the cleaning cycle.

These and many other unique advantages of Udylite engineering are shown in the new Full Automatic bulletin—write for your free copy.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

(Advertisement)

A STANDARDIZED MACHINE FOR PLATING

To meet the increasing demands for higher plating production and at the same time offer a plating and processing machine at lowest possible initial cost, The Udylite Corporation recently announced its new Cyclemaster. Udylite engineers say this new, completely automatic plating machine offers the greatest production of any machine built with comparable floor size.

The essential reason for its low initial cost is standardization. All Cyclemaster models have the same overall length, width and height. The only changes made are in the lengths of the various process tanks. These are changed to accommodate the desired cycles of plating, or processing and the rack size selected.

Each machine is 41 feet, 6 inches in length, of sufficient size to be ideal for cadmium and zinc plating and for copper-nickel-chrome too, where the cycle will fit into its standard length. A survey of the plating industry by the Udylite Corporation brought out that a machine of these specifications would meet the requirements of over 50% of the plating work in shops throughout the country.

The new Udylite Cyclemaster is a fully automatic machine. Its operation is so simple that any regular shop man can keep it operating at full capacity. One man can handle both loading and unloading of the plated parts.

An important feature of this new machine is a new standard multi-purpose carrier. It can be used for double spline or single spline racks. Made of special alloy metal, it has high structural strength and highest conductivity. The new carrier can also be easily adapted to inside anode plating if desired. With this carrier design the current travels only six inches from the cathode rail to the rack.

The Cyclemaster design follows many basic features incorporated in all Udylite machines, and so widely accepted by the industry. Some of these features are: Rack spacings can be varied in individual tanks; machine is operated by hydraulic mechanism permitting variable speeds for lift, lowering or horizontal movement of racks in and out of solution; horizontal transfer of the work carriers is accomplished by a simple tee member pusher mechanism operated hydraulically; tanks which are ventilated, have shields over them which reduces the amount of air exhausted to the outdoors. This cuts down fuel consumption.

Also, like other Udylite Fully Automatic machines, the Cyclemaster is completely assembled at the factory and run in before being shipped to the customer as a complete unit. This is easily accomplished as all machines are built on a rugged 4 inch I-beam base. If necessary, it can be shipped in two sections, which require only the bolting of the two sections together to put into operation.

(Advertisement)

CONTROL OF CHROMIC ACID MIST

Zero-Mist, the new surface-active additive for chromium plating solution control has been given enthusiastic approval by chromium platers. This new product has not only shown dollar savings to platers but has greatly improved health conditions in the plating room.

Udylite Zero-Mist is a completely stable, surface-active additive for decorative chromium plating baths which eliminates the usually troublesome mist and spray. When Zero-Mist is added, a thin curtain of foam forms at the surface of the solution which contains the mist and spray which are evident when Zero-Mist is not used.

While Udylite does not recommend elimination of proper ventilation in any chromium plating operation, there are reports of many platers using Zero-Mist successfully without washing the exhausted air. Zero-Mist has also proved to be of great benefit in plating rooms where wide tanks are difficult to ventilate, or where tanks of normal width are located near windows or doors, since it prevents the blowing of mist and spray due to the cross-currents of air.

From the dollar standpoint, Zero-Mist has shown remarkable savings to platers. Losses of chromic acid from mist and spray in the solution can amount to as much as 40 per cent. When dragout losses are also included, tests have shown Zero-Mist to cut chromic acid waste up to 70 per cent.

Temperatures of the chromium plating solutions have no deteriorating effect upon Zero-Mist. Additions are only required to replace the minor losses from dragout. Boiling concentrated chromic solutions do not break down or destroy its effectiveness, neither do the highest anode or cathode current densities. It is easy to maintain — very simple to control.

Zero-Mist acts by lowering the surface tension of a chromium plating solution. Because of this action, the solution runs off of the work rapidly when it is withdrawn from the tank and only a thin film remains. This minimizes losses up to 50 per cent. By reducing dragout losses, disposal problems are decreased greatly and rinse contamination and rinsing requirements are not as large.

The concentration of Zero-Mist for the complete suppression of mist and spray varies with the bath temperatures, especially its surface temperature. With lower temperatures, lower concentrations of Zero-Mist can be used. Temperatures of about 105° F are most economical for initial make-up. Maintenance additions of Zero-Mist vary only with the amount of dragout. Two to four times per month is normal. With no dragout, concentration of Zero-Mist stays practically constant.

THE UDYLITE HI C BRIGHT NICKEL

The Only High Chloride Bright Nickel

SAVES NICKEL

With the better throwing power, less nickel is used to get minimum coverage requirements in recesses.

Baths with lower nickel concentration are used to get the same results —⅓ less nickel concentration—decreased dragout losses.

The best anode corrosion of any nickel bath means fewer anodes needed —reduced nickel inventory.

SAVES TIME

Faster plating with 50-100% more amperage without burning regardless of agitation method used. Even where agitation is not available this same improvement prevails.

Faster plating with higher bath temperature—can be as high as 190°F.

Highest tolerance of any bright nickel bath to zinc, copper, iron, chromium, chromic acid and other common inorganic impurities, no problems with hard water, and excellent tolerance to organic impurities—less shut down time of any bright nickel bath.

SAVES POWER

Less voltage required with the better conductivity of the Hi C. Bright Nickel Bath. It means higher current with same voltage or same current with lower voltage.

• • •

Exceptional Bright Plate Range—Excellent Leveling—Fast Rate of Brightening—Best in Ductility—Easy Control.

If you are not using Udylite Hi C.—you haven't tried it.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

INDUSTRY NEWS

General Offices

New $2,500,000 Center—At an open house and luncheon on June 20, attended by approximately 700 people, Metal & Thermit Corporation dedicated its new general office building, recently completed as part of a $2,500,000 combined general office, research and distribution center, in the Woodbridge-Rahway aera of New Jersey.

The affair was planned as an open house to welcome the employees, and their families, recently moved by Metal & Thermit from New York to New Jersey.

The ceremony was held in a large tent erected on the grounds adjacent to the new office building, and featured talks by H. E. Martin, Metal & Thermit president; William H. McLean, president, Chemical Division, Merck & Company, Inc.; and Robert B. Meyner, Governor of New Jersey.

Following the talks, a box luncheon was served, after which the guests were conducted in groups on guided tours of the new offices.

Open House

Continuous Duty Rectifier Power Source—A new 1540-ampere rectifier power supply, rated for 100 per cent duty cycle for the submerged arc process, has been announced by the General Electric Co.'s Welding Department.

Designed for operation on a three-phase 460 or 575 volt input (not reconnectable), the unit has an actual output range of 600 to 1600 amperes and can be operated continuously. It has a drooping volt-ampere characteristic, which limits the short circuit current.

The input voltage is stepped down by a bank of three transformers of the moving coil design, and then rectified by a bank of selenium rectifiers. The coils are motor driven to provide remote current adjustment. Controls for contactor and current output are mounted on the unit's enclosure, and both can be operated from a remote control station.

Change of Address—Sulphur Products Company of Greensburg, Pa., has moved its main offices from 228 McKeon Way to the McKeon Building at 621 West Pittsburgh Street.

Additional warehouse space at the new location will enable the company to maintain greater stocks and insure better service to its many customers throughout the continent.

Company Name Change—F. J. Stokes Machine Company, Philadelphia, Pa., will change its name to F. J. Stokes Corporation effective July 1, Francis Dougherty, Stokes' president, announced following the company's recent annual meeting at which stockholders approved the change. The new designation was selected as being more in keeping with the broad range of the company's interests and the varied line of production and processing equipment which it has developed during its 60 years of growth.

Name Change—Fischer & Porter Company, Hatboro, Pa., has changed the name of its Chlorination Division to the Water & Waste Division.

The new name will describe more accurately, F&P's activities in water treatment, sewage treatment, and industrial waste fields through the sale of engineering services, chlorination and other chemical feed equipment, and instrumentation.

New Rep—Metalwash Machinery Corp. of Elizabeth, N. J., announces the appointment of Ralph C. Schwarz & Sons, Rochester, N. Y., as its representatives in the western area of New York State.

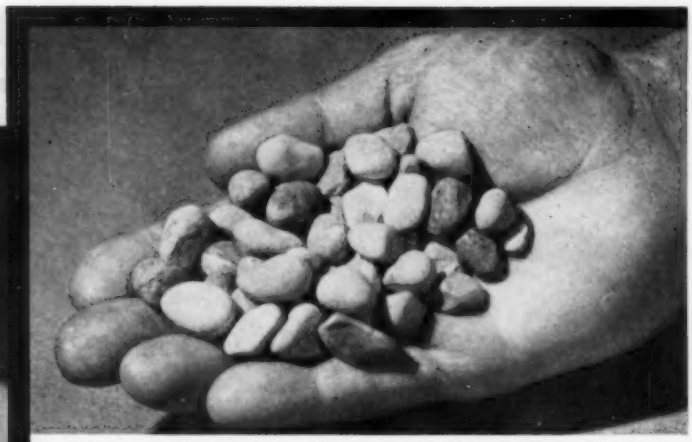
The new representatives will handle the complete Metalwash line of processing machinery for washing, pickling, drying, phosphatizing, heat treating, ultrasonic cleaning, degreasing and complete finishing systems.

The principals in the Schwarz organization are Ralph C. Schwarz, Ralph C. Schwarz, Jr., and Peter D. Schwarz, all engineering graduates of Cornell University.

Plant Expansion Program—In order to meet the growing demand for their chemical products, oils and greases used by the metalworking, textile, leather, paper and plastic industries, Harry Miller Corp. has recently added 33,200 square feet of space for increased production to their existing plant at 4th and Bristol Streets, Philadelphia 40, Pa. Included in the Company's expansion program is the addition of production equipment such as stainless steel mixers including a new 15 barrel stainless steel horizontal mixer. Other additions to the physical plant include the air conditioning of offices and laboratories, a new shipping dock, loading and unloading platform, outside covered storage area and a new parking lot for employees and visitors.

Expansion

ALUNDUM* TUMBLEX "A" ABRASIVE, for general barrel finishing. Can perform several operations in one: removes flash, heat treat scale, tool marks, deburrs, forms radii, and finishes to desired microinch. Available in eleven sizes.



TUMBLEX "N" ABRASIVE, for high lustre, especially on die castings and soft metal. Rounded uniform shape brings out the most desirable color of the finished parts. Available in seven sizes.

ALUNDUM TUMBLEX "T", a bonded, triangular shape, fast cutting tumbling abrasive for special shaped parts. The triangular shape prevents wedging in work slots or holes. Available in four sizes.

Barrel finishing is producing sensational results

...and 3 Norton TUMBLEX Abrasives lead you to the best method

Here are three steps that may yield some interesting advantages to you.

First, check your present method of deburring and descaling. If it is slow and costly, it is quite likely that barrel finishing can do it better, faster and cheaper.

Second, check the three Norton Tumblex materials shown above and decide if their properties would be suitable for your requirements.

Third, send us some work samples with a description of the results wanted — and include a finished piece. We will tumble the samples and return to you with full information covering the material and method used. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N. Y., a division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-308

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Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones Pressure-Sensitive Tapes

Colson adds More Proof

Barrel cuts plating time 80%

PLATING COSTS DOWN . . . from 80 hours a week to 16. That's what Colson gains by using perforated tumbling barrels in plating. It's Colson's new way of plating caster parts with cadmium and zinc. It pares costs 45 to 66%.

New way — Five perforated, hexagon welded plastic barrels replace baskets. Each barrel is suspended in the tanks by a heavy steel bracket and is rotated by a drive unit at 2½ rpm.— fast enough to give excellent coverage but not so fast that parts are nicked. An electric chain hoist moves barrels from tank to tank.

Old way — Operation was a bottleneck. Parts were loaded into baskets, then dipped in a series of six tanks. Neither the work nor the solution was agitated, so coverage wasn't uniform. Repeat treatment was needed often.

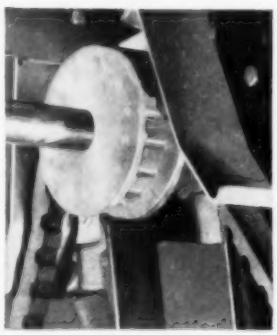
(above) Reprinted courtesy Factory Management and Maintenance July 1956, Page 94, "Putting Big-Time Ideas to Work" at Colson Corp., Elyria, Ohio)

that G-S *means Greater Savings!*

COLSON SWITCHED TO G-S BELT-DRIVE BARRELS CUT TIME, COSTS AND IMPROVED QUALITY

"When a production man can see a way to save manhours, and money while producing a better product, he's always interested" said Jack Davis, Plant Manager of Colson Corp., Elyria, Ohio. We changed over our plating line to G-S Barrels for cadmium and zinc. Now, after 3 years, our figures show manhour savings, and practically no maintenance costs or replacement of equipment.

Colson typical of all G-S installations! G-S "Cogged-V-Belt" Drive Plating Barrels offer platers larger loads, faster, better plating at higher current densities. They deliver "through cycle" service, and longer equipment life with no down-time. No other equipment can match G-S feature-for-feature at *any* price! (U. S. Pat. 2, 562,-084. Other Pats. Applied For.) That's why G-S equipped platers are getting the biggest returns per investment in the industry. Check into the G-S Conversion Plan for *your* plant. It costs *less* than you think, and will *pay for itself in savings.*



SAVE 100%

gear maintenance

Eliminated: cylinder end drive gear, idler gear, pinion gear, 3 bearings. No gears or bearings in solution.

"The Belt-Drive with the Gear Grip"—Exclusive G-S cogged V-belt and cogged drive-pulley, constant meshed for positive power transmission without gears. Can't slip, creep, vary speed. Cogged V-Belts steel tensile members won't stretch. "Locking U-Hubs"—danglers angled down through hubs won't ride up on load. Quick, easy changing of cylinder and danglers saves hours. Adjustable Bearings, Floating End Plates for constant contact. Total cylinder immersion prevents explosions. Cylinders of H-T Sincolite or Tempron (hard rubber) fusion-welded, heavy-ribbed construction. See more features than ever before offered. Send for Bulletin GSB 101.

The G.S. Equipment Co.

5319 St. Clair Ave. Cleveland 3, O.

ENdicott 1-0167

INDUSTRY NEWS BRIEFS

● Next year's automobiles will use one-third again more aluminum than 1956 models, an official of **Reynolds Metals Company** has said.

● The **Colorado Fuel and Iron Corporation** plans to spend some $23 million in the fiscal year ending June 30, 1956 on its program of plant modernization and development. Expenditures will be made for improvement to properties in both its Western and Eastern divisions.

● A compact, packaged, atom-fired boiler that will produce economical steam, heat, and hot water for industry may be only a few short years away, according to Frederick H. Klien, President of **Orr & Sembower, Inc.**, Reading, Pa., manufacturer of packaged automatic boilers.

● **The Haynes Co.,** 1215 East 20th Street, Tulsa, has been appointed manufacturers' representative for its complete line of polyethylene and polyvinyl chloride laboratory ware, self-supporting structures, and semi-finished components, by the **American Agile Corp.**

● The Tagliabue laboratory and industrial thermometer and hydrometer division has been purchased from **Weston Electrical Instrument Corp.** by the **H-B Instrument Co.** of Philadelphia, Pa. The Tagliabue line has been in continuous operation since 1834. This consolidation brings together two of the oldest companies specializing in the manufacture of scientific instruments utilizing glass and mercury.

● Addition of a 1500 square-foot wing to the **U. S. Plating Co.** plant, Fairmount (Cincinnati) will permit tripling of the present output. The improvement will make room for a complete automatic copper, nickel and chrome plating setup and an automatic electropolishing conveyor.

● Dr. Ronald C. Vickery, London-born scientist, and one of few world experts in the field of the "rare earths," has been appointed head of the Chemistry Department of **Horizons Inc.,** Cleveland industrial and governmental research organization.

● Robert J. Huber, President, **Michigan Chrome and Chemical Co.,** Detroit, Mich., has announced the acquisition of the assets of Pyramid Plastics Co. of Chicago. The facilities in Chicago will be expanded to manufacture and warehouse Miccro Products for better service to the Midwest area, according to Huber.

● On July 1, the **Du Pont Co.** announced a reduction of 25 cents a pound in the price of titanium metal sponge. Du Pont also plans to double the capacity of its Newport, Del., titanium plant by early 1958.

Service for Plating

●

Service is a work of many meanings to different people. True Brite regards service as an essential part of their business. It implies that friendly help which goes beyond the dependable product, prompt shipment and routine instructions for general operation.

●

Every plating department or shop has those once in a blue moon troubles which are outside all the listed difficulties and which do not respond to some normal correction. That is where True Brite service begins. Maybe you're putting a bronze color on aluminum using one of our high ratio brass solutions. These require special treatment because normal temperatures cannot be used. It's tricky but operable. Maybe you're troubled with a haze in your brass plating over bright nickel. One company was and trouble was traced to a tank lining. Or maybe your barrel nickel is dark in the recesses even after lengthy dummy plating. We found a simple cure for immediate use and could recommend a change to correct the source.

●

Many times a single telephone call will help. Sometimes it takes a complete analysis of your solution by our chemists. Whatever it takes, we like to solve your problems. Many of our customers give us a call even on minor problems. It always helps to feel you have a helping hand standing by. Maybe we can give you the explanations the boss wants. If you aren't in a hurry a letter will do although many times there are questions we'd like to ask.

●

True Brite makes products that are about as trouble free as possible but nobody can foresee all possible trouble, starting with the metal being plated and going through some dozen processes more or less before they go out the chipping room door.

●

Maybe we can help you. Just call or write a letter—attention of Henry Strow, and we'll try to help you with brass plating or barrel nickel plating.

TRUE BRITE CHEMICAL PRODUCTS CO.
P. O. Box 31 OAKVILLE, CONN.

Not just good looking work clothes...
but the most practical ever made!

See how you can save 93% on famous
ACID-RESISTANT WORK CLOTHES
styled and tailored by Worklon of
100% ORLON* and 100% DYNEL

Send for the most factual guide to uniform buying complete with comparison charts, colorful illustrations and fabric samples TODAY! See all types of work clothes made of **100% ORLON and 100% DYNEL, the only fabrics that GUARANTEE maximum resistance** to costly damage from acids and caustics... including two brand new 100% ORLON fabrics and a new Orlon blend. Of course all Worklon work clothes launder easily, dry quickly, look good even without ironing and are proved to outwear wool and cotton by 50 to 1. **(NOW... all 100% Dynel garments drastically reduced!)**

WORKLON WORK CLOTHES

*Du Pont Orlon acrylic fiber

FREE!
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FREE! Rush Worklon's new fully illustrated catalog of Orlon and Dynel Work Clothes.
Firm Name
Address
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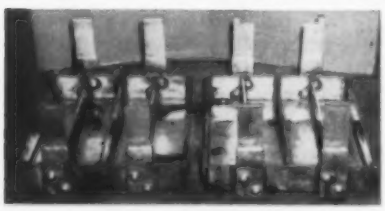
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 911.

Order the best
—call for
Anodes by
STORTS

When you need standard or special lead anodes—in plain or fancy design—Storts is always prepared to serve them to your order—with complete satisfaction guaranteed. And Storts anodes have a long standing reputation for high-performance utility.



This partial order of tray type lead anodes is typical of how dependably your special designs to meet special conditions are executed in our Anode Department. Let us quote on your present needs or assist you in designing special anodes for your requirements.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

INDUSTRY NEWS

Cripe

Electroplating Scholarship Winners Announced—The Joseph B. Kushner Electroplating School of Stroudsburg, Pa. has announced the winners in its recent "Electroplating Know How Scholarship Contest," as selected by the board of judges, Arch Doria, editor of PLATING, Ezra Blount, editor of PRODUCTS FINISHING and Nat Hall, editor of METAL FINISHING.

First Prize, a scholarship for the home study course in modern electroplating was won by Robert C. Cripe, of San Antonio, Texas.

Cripe is the process control chemist of the plating unit at the Kelly Air Force Base in San Antonio. He was graduated from Goshen College, Goshen, Indiana, with a BA in chemistry in 1941, took graduate work in chemistry at the University of Chicago, and served three years in the Air Force, leaving the service as a captain in 1946. Since that time, he has been associated with his present job. He is married, has one son, and is presently the librarian of the San Antonio Branch of the American Electroplaters' Society. His winning statement:

"There are now more opportunities than ever in the electroplating field because the freer exchange of information, the ever increasing scientific approach, and the entry of scientific experts into the field have resulted in the discovery and development of more and more applications for plating. These new applications, their development, and use, have created ever increasing opportunities for manufacturers, platers, and scientists."

Second Prize, a Sur-Ten Meter for measuring the surface tension of plating solutions and dips, was won by Lester J. Erckman, a senior standards engineer with Link Aviation, Inc., of Binghamton, New York

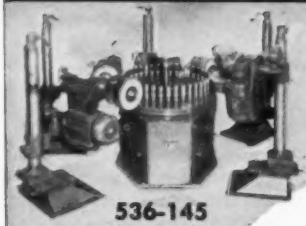
Third Prize, also a Sur-Ten Meter, was won by Lou Dabrowski, chemical engineer with the Canada Wire & Cable Co., Leaside, Ontario.

The fourth, fifth, sixth and seventh prize winners were each awarded a set of Tank Doctors, all plastic, comprehensive trouble shooting charts designed for convenient mounting right at the plating tanks where they are used.

(*Continued on page 1102*)

ACME *Rotary Automatics*

. . . cut costs on production finishing



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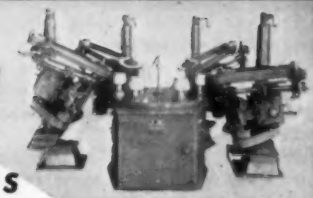

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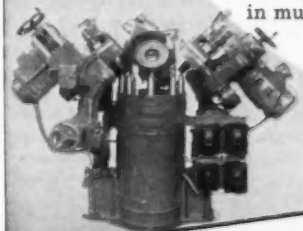
ROTARY TABLES ARE AVAILABLE IN SIZES UP TO 24 FT. DIAMETER

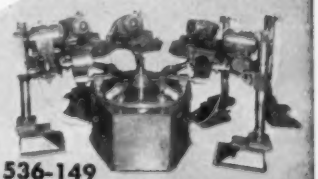
534-337

ACME 8 FT. *Combination Type* ROTARY AUTOMATIC

● This machine can be readily changed from a 32 spindle continuous rotary automatic to an 8 station indexing rotary automatic by simple hand crank adjustment. Various types of ACME adjustable floating head polishing and buffing lathes are used including belt arm attachments on buffing heads, utilizing the same heads for buffing or belt operations. Spindle arrangements are available in multiples of 8.

Rotary Catalog on Request.





536-149

RECOMMENDATIONS and QUOTATIONS . . . will be offered on receipt of blue prints or preferably finished and unfinished parts you contemplate finishing, together with details of your present finishing operations and production requirements.

SPECIAL MACHINERY — AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

INDUSTRY NEWS

Fourth Prize was won by Larry Klass, metallurgical engineer, employed by Bendix Products Division, Bendix Aviation Corp., South Bend, Indiana.

Fifth Prize was won by Charles A. Harrington, proprietor of the Cedar Rapids Metal Finishing Co. of Cedar Rapids, Iowa.

Sixth Prize was won by Jack Maisel, electroplater, employed by the Fairchild Camera & Instrument Corp. of Syosset, L. I., N. Y.

Seventh Prize was won by Gerald P. Boland, apprentice plater employed by the Stuart-Olver-Holts Co. of Rochester, New York.

Abstract Service—Interscience Publishers, Inc. announces the inauguration of Quality Control and Applied Statistics Abstracts, a monthly loose-leaf abstract service covering the world literature on Quality Control, Operations Research and Industrial Applications of Statistical Methods of all kinds. More than 400 journals will be scanned, for articles that present new information in the field, and the abstracts will be sufficiently comprehensive to show the significant contribution of each article, so that it will usually be unnecessary to consult the original paper.

The Editors of the new Abstract Service are Dr. Robert S. Titchen, Operations Analyst, Division of Defense Labs., MIT (Navy Department, Washington, D.C.); Arnold J. Rosenthal, Senior Research Chemist, Celanese Corporation, Summit, N.J.; Bruce Bollerman, Director of Quality Control, Electronic Tube Coil Company, Orange, N.J., and Frank Nistico, Supervisor of Evaluation Engineering, General Electric Company, Cincinnati, Ohio.

Quality Control and Applied Statistics Abstracts will consist of one volume of about 1,000 pages yearly, divided among 12 issues, beginning in June 1956. The subscription price is $60.00 per volume.

Scientific Electric Obtains New Patent—Another patent, No. 2,739,838 has recently been issued to John Sedlacsik, owner of Scientific Electric. The new patent relates to apparatus for electrostatically spraying conductive materials without hazards of high voltage feed back. As with previous patents, the new patent will be accessible to users of Scientific Electric's line of "Ionic" Electrostatic Spray Systems, without royalties.

ULTRASONIC METAL CLEANING—BETTER, AT LESS COST!

Ransohoff

automatic indexing double monorail conveyor

with Bendix-perfected ultrasonic unit

See it in operation at the METAL SHOW, BOOTH 2734, Cleveland, Ohio, October 8-12

"Scrubs with Sound" saves time, space and money

• Wash • Rinse
• Ultrasonic Cleaning
• Rinse • Dry

Combining an ingenious conveyor design with proven Bendix ultrasonics, the Ransohoff Conveyorized Ultrasonic System puts "impossible" cleaning jobs on an entirely automatic basis!

No part is too difficult to clean economically . . . regardless of blind holes and difficult recesses encountered in castings, engine parts, valve bodies. No part is too fragile for the thorough cleaning performed by this machine.

This 5-stage ultrasonic machine does a complete cleaning job, does it fast and automatically. Operations include: wash, rinse, ultrasonic cleaning, rinse and dry.

For complete details on Ransohoff ultrasonic cleaning systems and other equipment, write **Ransohoff, Inc., 610 North Fifth St., Hamilton, Ohio.**

Ransohoff

An old name... the newest ideas

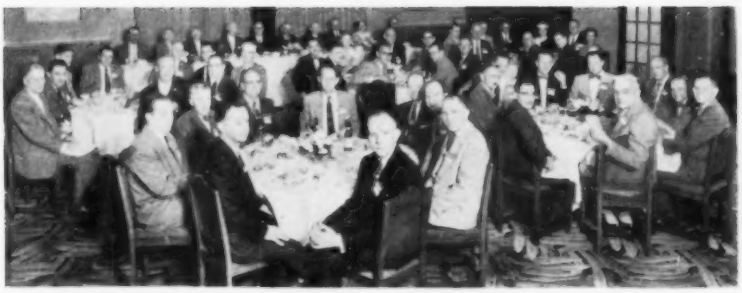
L. D. COOK, CORROSION ENGINEER, ON ILL-FATED UAL FLIGHT

The worst airline diaster in the history of commercial aviation, the mid-air collision between a TWA Super Constellation and a UAL DC-7 which claimed 128 lives on Saturday, June 30, brought to a tragic end the career of L. D. Cook, sales engineer with the Bart Manufacturing Corp. On business in the Los Angeles area, Cook was aboard the United Airlines' DC-7 enroute to his firm's Detroit office to wind up his affairs, prior to going on vacation.

Formerly head materials engineer with Wyandotte Chemicals Corp., Cook was acknowledged by fellow engineers to be an expert in the fields of corrosion and product contamination control. His contributions in these fields include extensive work as technical consultant on materials of construction for major chemical equipment used in production processes.

One of the organizers and founders of the Detroit section of the National Association of Corrosion Engineers, Cook had been a licensed Professional Engineer in the state of Illinois, and a member of the American Chemical Society, American Society for Metals, and ASTM.

Surviving are his wife Dorothy, and three children, David Jr., 14, Raymond, 12, and Susan, 8, who reside at 8668 Kenberton, Oak Park, Michigan.



Party of Long Service

Total of 1150 Years of Service—The Udylite Service Club held its annual party at the Detroit Yacht Club, in Detroit. It is made up of men and women employees who have been constantly employed by Udylite for 15 years or more. There are 57 members of the Service Club representing 1150 years. These employees were called in from all over the country to attend this party which is an annual affair. The greatest length of service is represented by L. K. Lindah, Chairman of the Board, with 31 years. There were 10 employees at the head table all of whom had service of 25 years or more.

At this party, 4 gold watches, commemorating 20 years of service, were given to Dr. R. B. Saltonstall, technical director, H. J. Ward, Michigan District sales manager, W. Jackson, who is head of the Plating Barrel Engineering Department and V. E. Zobel, director of purchases. In addition there were 7 service pins presented recognizing 15 years of service.

Memorial Fund

Such is the honor and respect accorded the late Fred W. Wagner that almost before the news of his death reached the press several customers and friends of Wagner Brothers started a Fred W. Wagner Memorial Fund. This Fund is planned as a perpetual trust Fund for a needy student studying chemical engineering at Wayne University.

Any reader interested in further details should contact Joe Wagner.

Safety Award—Robertshaw Thermostat Division of Robertshaw-Fulton Controls Co. receives top safety award of the Pennsylvania Manufacturers' Association for more than a million man-hours of work without a disabling injury.

The award, in the form of a plaque, is presented by James F. Malone (left), general manager of the Western Pennsylvania Division of the manufacturers' group. Receiving it is George Mertz, superintendent of the award-winning plant, at ceremonies during a meeting of the Robertshaw Management Club.

The award recognizes an accident-free run of 1,204,115 man-hours of work by approximately 1500 employees at the Robertshaw Thermostat Division.

One Robertshaw member of the nationwide "Wise Owls" organization—an honorary group composed of workers whose use of proper safety equipment has saved them from serious eye injury—also was honored. He is Paul Falcon, who was wearing safety goggles when splashed by molten metal in a foundry accident. The hot metal melted both lens and frame of his goggles, but his eyes were saved.

Another "Wise-Owl"

How to IMPROVE YOUR PLATING OPERATIONS with SEYMOUR BRIGHT NICKEL

TO OBTAIN THIS DEPOSIT — USE THIS SEYMOUR BRIGHT NICKEL PROCESS

	*Type	Solution	Active	Method	Deposit
BRIGHT	C	Warm	Yes	Still	Decorative
BRILLIANT	NC	Warm	Yes	Still Barrel	Decorative Specification
ULTRA BRILLIANT	CK	Warm	No	Still Barrel	Decorative Specification
NORMAL NICKEL	R	Cold	—	Barrel	Decorative
BLUISH TINT	NR	Cold	—	Barrel	Decorative
DEEPER BLUE	RS	Cold	—	Barrel	Decorative

(*) For best results use these solutions with SEYCAST 99% cast anodes. Write for SEYMOUR bulletins giving complete details.

SEYMOUR BRIGHT NICKEL PROCESSES efficiently deposit on steel and ferrous alloys, on brass and nonferrous alloys and on zinc-base alloys which have been previously copper-plated.

They give you these important features: —

- GREATER THROWING POWER to successfully plate deeply recessed articles.
- HIGH DUCTILITY (in all but the "CK" process) which permits further fabrication after plating.
- MINIMUM OF CONTROL with easy operation and freedom from hydrogen pitting.
- SAVINGS in time and money because active surfaces require no reactivation, cleaning or wiping before chrome plating.

THE SEYMOUR MANUFACTURING CO.
5 FRANKLIN STREET, SEYMOUR, CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 915.

PERSONALS

Bernhard W. Weber has been named to head manufacturing operations of Metal & Thermit Corp., as manager of manufacturing. He succeeds **Walton S. Smith** who recently retired as vice-president in charge of manufacturing. **H. Alfred Rack,** formerly manager of engineering, will take over Weber's former post as production manager.

Weber

Orden

David Birger Orden has been named Latin-American representative. His headquarters will be in Mexico City, and he will contact Metal & Thermit's distributors and direct customers in Latin-America. Orden has spent several years in Latin-America, and has been specially trained to offer technical assistance in applications of M&T products.

Donald W. Oakley has been transferred from assistant production manager to technical advisor to the president. In this post he succeeds **A. James Fisher** who was recently named general sales manager.

Oakley

Betz

George Betz has been named product manager for chemicals and metals. He has been connected with Metal & Thermit since 1944 as sales manager of ceramic materials and chemicals.

Harry W. Buchanan, III, has been named sales manager of chemicals, metals and plating products. Buchanan has been associated with Metal & Thermit since 1947 in various research, production and sales capacities.

Tinnon

Buchanan

Edwin M. Tinnon has been placed in charge of distributor relations. In this newly created position, he will also report to **Harry Buchanan.** Tinnon joined Metal & Thermit in 1949, serving as senior sales engineer of industrial chemicals.

Donald R. Meserve will serve as product manager for coatings. He has served with Metal & Thermit associated companies in several capacities since 1942, most recently as assistant manager of sales of electroplating and coating.

Henry Mahlstedt has been appointed product manager for plating products. He has been connected with associated companies of Metal & Thermit since 1927; he was for seven years sales manager of chromium plating products.

Robert T. Brown continues as sales manager of M & T's welding products.

Mahlstedt

Lang

Ronald J. Lang recently joined the industrial sales and service staff of Wyandotte Chemicals Corp. Lang, a native of Detroit, is a graduate chemist of Detroit Institute of Technology and will headquarter in Wyandotte's Motor City office.

Jack Keyes has been appointed as vice-president in charge of Western Michigan Sales. **Richard Watson** has been appointed to manage the office, cooperating with Keyes.

A. E. (Bud) Webber has been promoted to the position of Udylite sales engineer. His assignment is the Pittsburgh area, working under the supervision of the Udylite Cleveland Office.

Webber

Reynolds

Russell E. Reynolds who has served Udylite customers in the Pittsburgh area as sales engineer for the past three years, moved into the Detroit District on July 1. He will serve as the Udylite representative in the Northwest section of Michigan.

Clifford Oates has been appointed sales representative of Magnuson Products Corp. He will cover accounts and prospects in the manufacturing, transportation and paper mill industry in central New York state, working out of Syracuse.

George A. Stutz, the founder of the George A. Stutz Manufacturing Co., has been elected chairman of the board, and his son, **George L. Stutz,** is now president. George L. was employed by the Stutz Manufacturing Co. as a salesman and acted in that capacity for eleven years.

G. A. Stutz

G. L. Stutz

Robert W. Jaeger was appointed as general manager of ARco Rubber Processors, Houston, Texas.

As head of ARco Rubber Processors, Bob Jaeger follows in the footsteps of

Richard D. Bailey, the former general manager for 1½ years. Dick Bailey has been moved up to general lining superintendent of all ARco Divisions working out of the Detroit headquarters.

A Timely Message on

Accomplishing the "Impossible"

by Ben P. Sax

President, American Buff Company

Seven years and half a million dollars are a big investment in buff research and development. But they are paying off in a big way for us . . . and for the entire metal finishing industry.

Our seven-year pioneering program produced the "pre-assembly revolution" which makes possible the "impossible" . . . *25% to 33⅓% more production from your present equipment.* The truly sensational conception of CENTERLESS buffs originated with American Buff engineers. This exclusive, patented construction—now available in seven different types of American Buffs—produces not only cooler, faster-running, non-burning buffs, but also changes the entire cost-picture in finishing.

Centerless construction makes possible astonishing savings in machine-down time and change-over labor costs . . . by "pre-assembly" of complete buffing heads for change-over in *minutes* instead of *hours!* Individual *centerless* buffs, locked together in desired width, are slipped onto special flanges with telescoping hollow shafts, and shafts are pressed together. The entire assembly takes only *minutes*—and the unit is ready to install in a single operation.

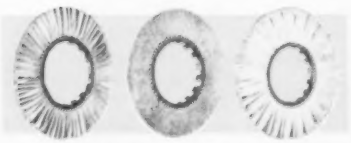
Now, how do we arrive at our promise of 25% to 33⅓% more production? For example: on a minimum saving of even 15 minutes per head in buff change-over, your 8-head automatic lathe gains 2 production hours in an 8-hour day. There's an immediate gain of 33⅓%. Safe higher speeds easily increase total daily output an additional 7½ to 10%, with consequent reduction in per-unit cost.

In an era where rising costs of machines and man-power threaten an increase in selling price or a cut in profits, it is a satisfying accomplishment to play even a small part in such an important contribution to the metal finishing industry.

Sincerely,

Ben P. Sax

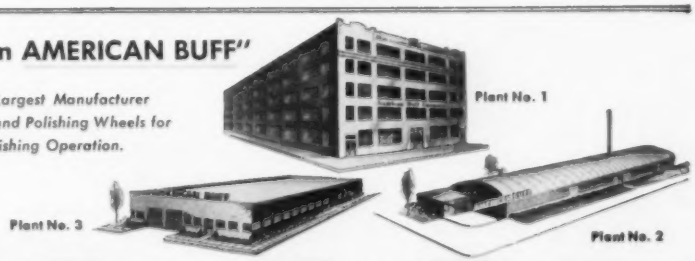
"For the job that's TOUGH—use an AMERICAN BUFF"



BIAS CLOTH • BIAS SISAL • UNIT CLOTH OR SISAL

Patented CENTERLESS Construction
Pat. No. 2,582,506

World's Largest Manufacturer of Buffs and Polishing Wheels for Every Finishing Operation.

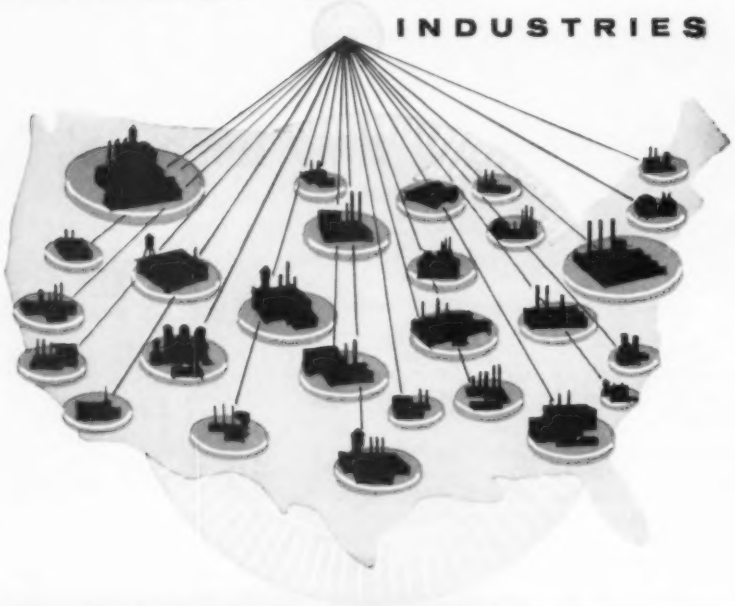


American Buff Company
2414 S. La Salle Street Chicago 16, Illinois

AMERICAN BUFFS ARE REGULARLY ADVERTISED IN FORTUNE MAGAZINE

Choice of the Nations

BLUE CHIP INDUSTRIES



MEAKER

ENGINEERED PLATING EQUIPMENT

Meaker equipment is used for efficient and economical plating by many of the nation's most important builders of such products as automobiles, appliances, machinery, furniture and many others. When they install Meaker engineered equipment they are assured that it is designed to meet specific requirements. They are also certain that Meaker will stand behind the equipment during its whole operational life, making sure that it produces the best possible plating job at reasonable unit costs.

Meaker has accomplished much for other manufacturers. Why not find out what we can accomplish for you? Our engineers will be happy to survey your problems with you and recommend the equipment you need. Call or write today!

THE MEAKER COMPANY

1633 SOUTH 55th AVE. • CHICAGO 50, ILLINOIS • Phone OLympic 2-2110

• Full Automatic and Semi-Automatic Plating Machines • Strip Steel Plating Equipment • Wire Galvanizing Equipment • Batch Type Plating Machines • Pickling Machines • Motor Generators for Plating • Processing Conveyors • Rectifiers for Plating

PERSONALS

Sonnenfeldt

Rene Sonnenfeldt, recently appointed sales engineer for the Bart-Messing Corporation, Belleville, N. J., has a background which not only well qualifies him for his position, but which would also form the basis for a mystery thriller of war-time intrigue.

A Medical Science Major at the university in his native Utrecht, Holland, during the Nazi occupation in 1943, Sonnenfeldt's refusal to sign a "Bill of Loyalty" to the Nazi Government caused him to be expelled from school. Immediately thereafter, he helped to make things "hot" for the Nazi Army of occupation by his activities with the underground forces of North Holland. Captured during a sabotage raid, Sonnenfeldt spent ten months—August 1943 to May 1944—in a concentration camp.

A carefully conceived plan enabled Sonnenfeldt to escape in May 1944, only to be captured again in August of the same year—this time by the dreaded Gestapo. Even before his captors had a chance to begin serious questioning, he escaped three days later. Making his way back to the Underground Forces, he continued his "behind-the-line" activities for eight months—until March 18, 1945, at which time he was captured for the third time—his second capture by the Gestapo.

Now the Gestapo is not noted for kindliness towards prisoners—especially those who have caused major embarrassment by escaping from under their very noses. An experienced escape artist by this time, Sonnenfeldt did not wait around to find out what was in store for him. Two days later—on March 20—he escaped for the third time.

After the war, Sonnenfeldt served a hitch in the regular Dutch Army; and upon his return to civilian life, took up his studies again, this time majoring in Chemical Engineering.

Prior to joining Bart-Messing, Sonnenfeldt held sales engineering positions for Dutch companies which took him to several European countries "trouble-shooting" and on service calls. In the United States, he held positions with American Plating Inc., Zelionople, Pennsylvania, and Bart Laboratories, Belleville, N.J.

Sonnenfeldt's position as sales engineer for Bart-Messing entails sales of major equipment such as rectifiers and plating units, as well as precious metals salts and processes in behalf of Sel-Rex Precious Metals, Inc., an associated company.

how to produce a uniform black

on ZINC or CADMIUM with good corrosion protection

Need a good, fast economical jet black finish with good corrosion protection?

Then KENVERT # 11-B is your answer. Insures a constant uniform color with a process that's both easy to operate and maintain.

Other features are its fast processing, that it produces uniform deposits and that its cycling can be adjusted to automatic machine operation.

KENVERT # 11-B is ideal for many industrial and commercial applications such as typewriters, cameras, hardware or wherever the present black finish does not provide proper protection.

Samples cheerfully treated at no obligation.

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100 E. Main Street, Rockville, Conn.

PERSONALS

Hennessey

Wm. J. Hennessy has been appointed eastern regional sales manager for Kelite Corp. The eastern region is made up of the Middle Atlantic and North Atlantic states, plus the state of Ohio.

Joseph Vouglas has been appointed sales engineer in the Plating and Electrochemicals Department of Federated Metals Division of American Smelting and Refining Co. Vouglas will make his headquarters at the Newark Office of Federated and cover the Eastern sales territory which covers N. Y., Conn., N. J. and Penna.

Two promotions in the Electro Chemicals Division of Diamond Alkali Company, Cleveland, Ohio, were announced by **Frank Chrencik**, general manager of the division:

Lloyd R. McCoy, since 1946 assistant to the manager of chlorine sales, takes over the newly created post of supervisor of the Electro Chemicals Division's Technical Service Section of Diamond Alkali Co. He will make his headquarters at the Diamond Research Center in Painesville.

Warren Dusenbury, who had worked at Diamond's national headquarters in various clerical capacities from 1952 to 1954, becomes divisional staff assistant on caustic soda sales.

J. F. D. Rohrbach, President of Raybestos-Manhattan, Inc. and Chairman of the Board of Raybestos-Manhattan (Canada) Ltd. has announced the following executive appointments: **J. Stewart Munro**, B. A. Sc., to President of the Canadian Company and **Douglas Pocock** to the newly-created post of Vice President, Replacement Sales.

Munro joined Raybestos-Manhattan (Canada) Ltd. in 1941 as Plant Engineer and has advanced through many important positions including those as Chief Engineer, Assistant General Manager and Vice President. As President, Munro succeeds Robert Abbott who, although in retirement, will remain as a Canadian Director of the Company.

Pocock, one of the best known men in the automotive service field, joined Raybestos-Manhattan (Canada) Ltd. in 1920, and has held the post of Sales Manager since 1940. His appointment to Vice President, Replacement Sales recognizes the importance of this operation and acknowledges the significant contribution Pocock has made in this field.

Available for Immediate Shipment, Attractive Values

The following excellent rebuilt and guaranteed electroplating motor generator sets and rectifiers, with full control equipment:

PLATERS

4—12500/6250, AMPERE, 6/12 VOLT Electric Products, Synch.
1—8000/4000 AMPERE, 6/12 VOLT, **CHANDEYSSON**, Synch.
1—7500/3750 AMPERE, 9/18 VOLT, **HANSON-VAN WINKLE-MUNNING**, Synchronous.
1—6000/3000 AMPERE, 6/12 VOLT, Electric Products, Synch.
1—3000/1500 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Exciter-in-head.
1—2500/1250 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS**, Synchronous, Exciter-in-head, 25°C.
1—2000/1000 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING**.
1—2000/1000 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS**.
1—1500/750 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING**, Synchronous, Exciter-in-head.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Synchronous, Exciter-in-head.
1—1000/500 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS**.

ANODIZERS

1—1000 AMPERE, 40 VOLT, **CHANDEYSSON**, 25° C.
1—1000 AMPERE, 30 VOLT, **IDEAL**, Exciter-in-head.
1—750 AMPERE, 60 VOLT, **HANSON-VAN WINKLE-MUNNING**, Synchronous, Exciter-in-head.
1—500 AMPERE, 25 VOLT, **CHANDEYSSON**, Synchronous, Exciter-in-head.
4—400 AMPERE, 40 VOLT, Separately Excited.

RECTIFIERS

1—2000/1000 AMPERE, 6/12 VOLT, **G. E.**, brand new selenium stacks, with "On-load" Automatic Voltage Regulator.
1—**GREEN SELECTOPLATER**, 1800 AMPERE, 12 VOLT, 220/3/60.
1—BRAND NEW 2000/1000 AMPERE, 6/12 VOLT, **G. E.** COPPER OXIDE RECTIFIER, with Controls.
1—1500/750 AMPERE 6/12 VOLT, UDYLITE-MALLORY
4—1440/720 AMPERE, 6/12 VOLT, UDYLITE-MALLORY

SPECIAL

1—TOLLHURST CENTRIFUGAL DRYER, 20" dia. basket, with Steam Heat
1—H-VW-M Full-Automatic Plating Machine, 87' long, 39" lift, was used for chrome.
1—UDYLITE Semi-automatic Plating-Machine, for cyanide, size 19' long x 48" wide x 36" deep.
2—**RONCI** Enamelers, No. R-100 and No. R-200.
1—MODEL "A" PRESSURE BLAST.

Above is partial list only. Write to us for all your requirements for Plating, Anodizing and Metal Finishing

WIRE—PHONE—WRITE

M. E. BAKER CO.

25 WHEELER STREET

Kirkland 7-5460 CAMBRIDGE 38, MASS.

The abbot and the Million Shiny Buckles

The *abbot* studied the small watchband buckles. Each was stamped from stainless steel with nicely defined, square corners, evenly spaced decorative ridges and precisely placed pinion holes.

The little man's visitor wore a worried frown. "How," he asked, "can we put a good, shiny finish on a million of 'em, quickly and economically?"

In less than a week, the *abbot* mailed his meticulously typed reply. "Your watchband needs burnishing," he wrote, "Try barrel burnishing with Abbott 3/16" Diagonals. You'll find they are shaped to do the job right. Besides, the Abbott Method is fast, economical and thorough."

Abbott Burnishing Materials make efficient and uniform contact on metal parts and castings of every size and shape. Made from selected carbon steels, they are Deep Hardened with a glass-hard, mirror-like finish. Combined with the Abbott Vertical Barrel, they make the *perfect* barrel finishing combination.

Let the abbot show you how The Abbott Method can help you. Just drop a line to . . .

ABBOTT

The ABBOTT BALL Company

1054 New Britain Avenue
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COVER STORY

Palmated Spicular Crystals

There are protective coatings that are nonmetallic, yet which are not paint nor organic in nature. They consist of a chemical modification of the metal surface so that the coating so formed is an integral part of the parent metal; the surface is literally converted.

Conversion coatings provide an insulating barrier of exceedingly low solubility between a metal and its environment. The metal surface has been converted into a corrosion-resistant, nonreactive form.

One of the papers presented at the 43rd Annual AES Convention was, "A Study of Phosphate Treatment of Metals," by Lloyd Gilbert,* Rock Island Arsenal. In his paper, Gilbert provides a practical explanation for the functions performed by the various constituents of the solutions used in phosphate coatings.

Gilbert has some 44 illustrations, about one-half of which are photomicrographs which are taken at low-power, (100X). Here are seen the dramatic crystalline products of phosphate coatings. The shape of the crystal depends upon the metallic element used in conjunction with the phosphate complex.

The picture on our cover is a photomicrograph which shows a pure iron phosphate produced by prolonged treatment of ingot iron in a solution of sodium dihydrogen phosphate. The prominent palmated spicular crystals are characteristic of iron phosphate coatings. The well-defined crystal faces, edges and angles are significant. In some other element combinations, the crystals are fragmented, have ill-defined edges and are eroded on the crystal faces. This particular photomicrograph makes a fascinating study in chiaroscuro.

The metals for which surface conversion treatments have attained marked commercial significance are iron and steel, aluminum, zinc and magnesium alloys. They are also used to a lesser extent on cadmium, tin, copper, brass and stainless steel.

The theory of conversion coatings formation is not simple. The coatings are of extreme value, and the products provide a scintillating array of crystalline formations that range from small, rounded, closely packed drab crystals to bright, sparkling, sharply defined formations like the one pictured on the cover.

*See 43rd Annual Proceedings, American Electroplaters' Society, 1956—to be published in the fall.

Luster-on® DIPS and POWDERS

Chromate Conversion Coatings

FOR:

ALUMINUM
Aluminum sealer replaces anodizing when hardness is not a prime factor. Protects well and offers excellent paint-bond.

ZINC & CADMIUM
Chrome-like brilliance and corrosion protection at less than 1/5th of one cent per square foot. Long-lasting, easily controlled application.

BRASS & COPPER
Cobra C — for long-lasting protection by a simple dip.

ZINC & CADMIUM
Khaki-drab protective finish giving a colored finish with excellent corrosion protection.

DIE CASTINGS
One quick dip gives a uniform, low cost finish ideal as a base for later painting.

AND

New Luster-on® 50 Powder

FOR ZINC OR CADMIUM
Bright, clear coatings with no expensive handling, space-consuming storage or carboy deposits.

Data Sheets and Prices on Request

THE Chemical CORPORATION
57 Waltham Ave., Springfield 9, Mass.

CONTINUOUS MICROSCOPIC FILTRATION

Fulflo® Filters

FOR FLAWLESS PLATING

Honeycomb Filter Tubes ensure high flow-rate, low pressure-drop, long tube life for low cost, true depth filtration and precision-controlled density for any desired degree of continuous microscopic clarity.

A leading motor car maker eliminates costly rejects due to microscopic impurities in two 25,000 gallon bright nickel tanks by filtering entire contents every hour through 96-tube FULFLO Filters of rubber-lined steel. The installation includes two groups of three filters each in parallel with one in reserve as a standby.

STOP COSTLY REJECTS WITH FULFLO FILTERS

Commercial Filters Corporation
MELROSE 76, MASSACHUSETTS

UNICHROME
Trade Mark

News about

COATINGS for METALS

Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

SRHS® Solutions make shorter work of hard chromium plating

Quick facts on stop-off materials

Stop-off materials have to be endowed with exceptional chemical resistance. They must remain completely unaffected by hot, active plating baths . . . and contain no contaminants. Unichrome Stop-Off Materials not only meet these requirements but are also available to satisfy the preferences of platers for a particular method of application.

COMPOUNDS SAVE MONEY

Unichrome Wax-Type Compounds are applied by dipping. They can be melted off the work when the job's done, and reused. Types are available for high as well as moderate temperature baths.

CONVENIENT TO APPLY

Unichrome Stop-Off Lacquers are preferred by some because they apply easily by dip or brush, dry fast, cut to a sharp line. Many other shops are confirmed users of Unichrome Vinyl Tape for its extra convenience of quick, snug wrapping of the work. Stop-off shields molded from Unichrome Plastisol Compounds give long-lasting service and are well worth making for volume work in hard chromium plating.

Send for details.

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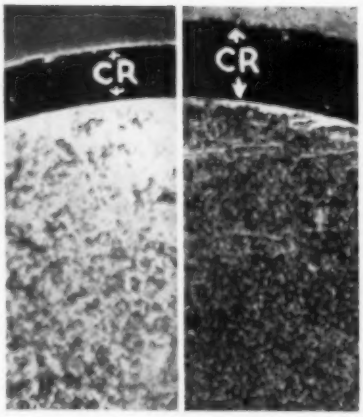
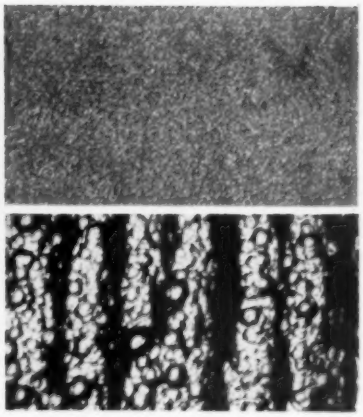


Macrograph of steel rod cross section at left with 0.016" chromium deposited in 16 hours by ordinary solution. Identical rod section at right in SRHS under identical conditions got 40% thicker deposit.



Surface photomicrographs: SRHS Chromium (top) levels over surface irregularities. Ordinary chromium at bottom shows no such action. Both baths operated 7 hours under identical conditions.

Plants save plating and grinding time with Unichrome high speed plating process*

Two features of Unichrome SRHS Chromium prove particularly beneficial in hard chromium plating operations. For years now, they have enabled platers to cut costs substantially.

TIME CUT IN HALF

With higher cathode efficiency and wider bright plate range, SRHS Chromium permits plating at up to twice the speed of ordinary chromium. This accounts for results like these: Piston rings plated in half the time formerly required in ordinary solution . . . Work which took 3½-4 hours was done in 2½ and with fewer rejects by SRHS . . . Shop reported ability to deposit .002" to .003" per hour with SRHS Chromium.

BETTER LEVELING ACTION

Deposits from SRHS Baths help level over the usual surface imperfections on the base metal. They also exhibit a smoother surface free from nodules. Grinding time is thereby cut. As a further result, less thickness need be deposited to allow for grinding, permitting still more savings in plating time.

Other important advantages of SRHS Solutions for hard chromium or for decorative plating include power savings, and capacity to plate more work with existing equipment.

Self regulation of important constituents makes SRHS Chromium a more fool proof bath, too . . . one which maintains optimum plating balance and avoids control problems. Send for Bulletin which tells more.

**Unichrome is a trademark of Metal & Thermit Corp.*

ALWAYS FINISHES FIRST

and cuts costs two ways because it's completely automatic!

fast cutting, easy cleaning with

Liquimatic®

the perfect liquid compound for all metal finishing

What are the two big cost factors in your buffing room? Chances are *buff life* figures big when you're talking production costs . . . and the second big factor is *production time* itself. Liquimatic Application Systems are licking these two cost problems in buffing rooms all over the U. S.—because Liquimatic is automatic. An electrically timed system feeds Liquimatic Buffing Compound to the buff in the exact amount to give you the exact cut you need. Because the buff is continually lubricated, buff life is extended up to 200%!

And with Liquimatic there's no compound wasted, no nubbin problem, no hand application, no changing bars —think of the cost savings you can effect in *your* buffing room with these advantages! Savings in buff life alone can soon pay for a complete Liquimatic Application System . . . a system that will continue to save you money – *automatically*.

Check the other features of Liquimatic Buffing Compound . . . then write today for your free copy of Liquimatic's big, new folder that tells the whole cost-saving story of Liquimatic in *your* buffing room.

These additional Liquimatic features mean real savings in terms of time, money, safety—

- longer buff life
- completely automatic
- fast cutting
- easy cleaning
- non-settling
- high flash point
- long storage life
- sprayable viscosity
- adhesive slow-wearing buff face

Liquimatic *. . . gives more buff mileage*

PLATEMANSHIP

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING CO. • MATAWAN, N. J.

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H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

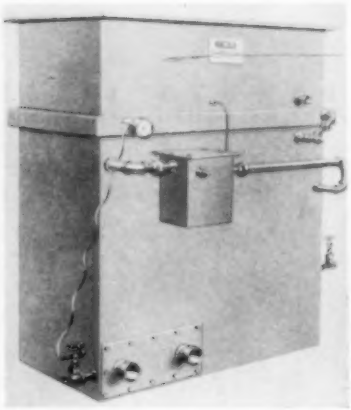
L—900. Burnisher and a Cleaner—Apothecaries Hall offers a new bulletin containing detailed information on Ahco Burnishing Compound No. 44. This compound is for use in conventional types of tumbling equipment to produce a bright finish on steel and nickel parts.

Another bulletin giving full details on Ahcoloid Cleaner No. 210 is offered by Apothecaries Hall. This material is for the descaling and derusting of steel and iron parts without significant attack to the sound base metal.

L—901. Centrifugal Pump—A new catalog sheet describing the new Bart Laboratories "Flex-Seal" centrifugal pumps has just come off the presses.

The literature describes a new two-piece seal which can be installed or replaced by any shop workman and requires no further adjustments. The "Flex-Seal," which is constructed entirely of extra low carbon stainless steel, is also shown in an "exploded view" that facilitates following operating and service instructions.

A special "rate of flow" chart clearly indicates the capacities and flow-rates of the "Flex-Seal" models now in production.



L—902. Metal Parts Degreaser—Available immediately is a bulletin describing a new metal parts degreaser manufactured by Circo Equipment Co. This new degreaser, designated the OP3, is specially designed for cleaning parts that have a tendency to nest or pack, or parts that have recesses difficult to penetrate with a hand spray. The OP3 cleaning cycle is based on a consecutive boiling solvent, warm liquid and vapor dip, and is described as ideal for removing tightly adhering greases, oils, tripoli and rouges.

The bulletin describes the unit's corrosion resistant construction features, operating characteristics, and solvent flow and distilling action. The auxiliary equipment and interchangeable heating systems for Circo's OP3 liquid-liquid-vapor Degreaser are also described. Schematic full view drawings and tables of specifications for all eight basic models in the OP3 series contain inside and overall dimensions, work load data, solvent capacity and thermal input requirements.

L—903. Two Technical Papers—A ten-page technical paper, describing their new Lectro-Nic Compressively Stressed Nickel Plating Process, has been prepared by Sel-Rex Precious Metals, Inc. Developed specifically as an undercoating to counteract rhodium electroplate's inherent high stress characteristics, the process, as described in the literature, utilizes only one addition agent with all other operating conditions being identical to conventional nickel plating.

Another, eight-page technical paper, has been prepared by Sel-Rex Precious Metals, Inc. This one describes their Silvrex Bright Silver Plating Process.

The new literature covers in detail such vital topics as bath make-up and maintenance; anodes, tanks, temperature; current densities; agitation; plating procedure; and simplified removal of solution impurities.

Introduced to the trade recently, the new process is said to give a mirror bright finish directly from the bath through a complete range from flash to extra heavy deposits, and produces hard (Brinnell 135) highly ductile deposits.

TANK HEATING PROBLEMS ELIMINATED!

CLEPCO FUSED QUARTZ IMMERSION HEATERS

Heating your acid tanks with Clepco Electric Immersion Heaters is the most modern and now the most proven of all methods known today.

ASK YOUR LEADING PLATING SUPPLIERS

OVER 100,000 INSTALLATIONS PROVE CLEPCO FUSED QUARTZ IMMERSION HEATERS ARE BEST

Clepco Steel and Stainless Immersion Heaters are designed to meet the specific demands of the Alkaline Bath heating problems of the Industry.

WHEN A BETTER HEATER IS MADE, CLEPCO WILL MAKE IT.

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FUSED QUARTZ
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SEE YOUR PLATING SUPPLY HOUSE
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THE CLEVELAND PROCESS COMPANY
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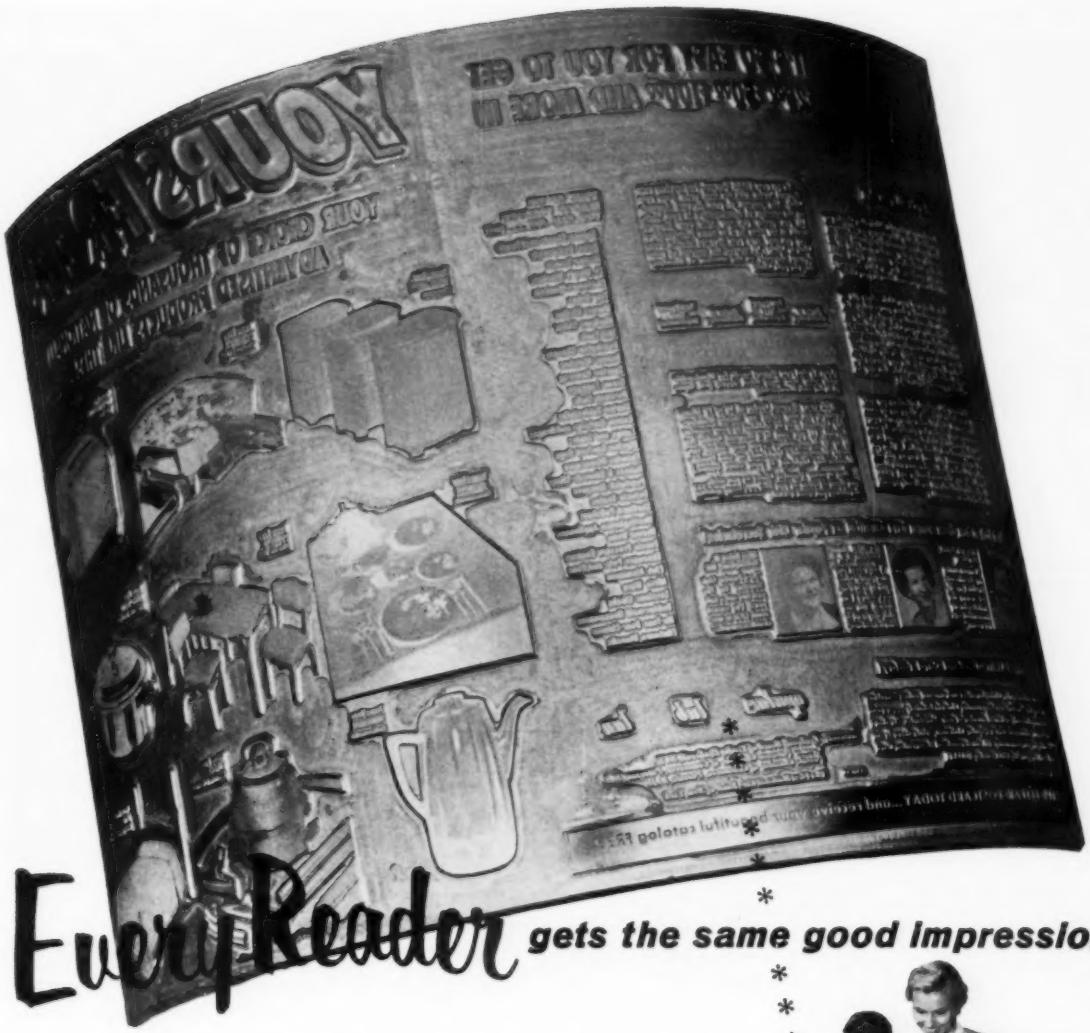
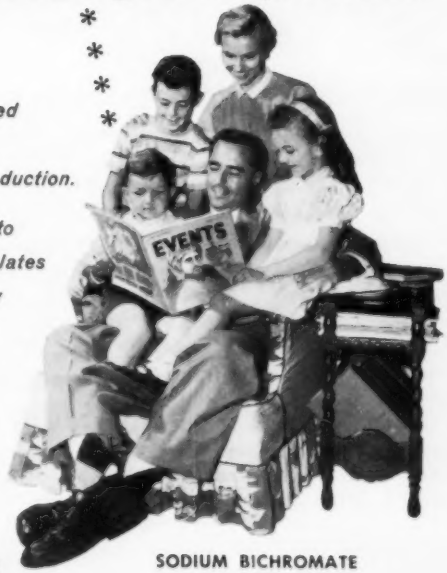


Every Reader gets the same good impression

• *Magazines with circulations running in the millions are faced with a serious problem. When the type or half-tone dots wear down to the shoulder of the etch, the result is a poor reproduction.*

To save press down-time in replacing worn plates, and to be sure of the same fine impression on the last part of the run, plates must have surfaces that are resistant to abrasion. That's why printers use chromium-plated letterpress plates, electrotypes and gravure rolls. Then they are certain of getting clear impressions on every sheet from the first to the last.

As a manufacturer of Chromium Chemicals, Mutual is proud to emphasize their use in the American publishing field.



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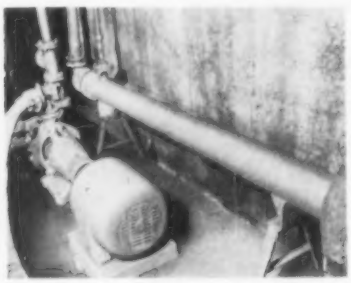
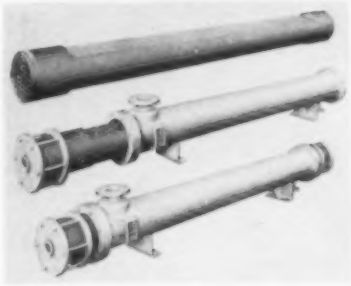
Equipment and Supplies



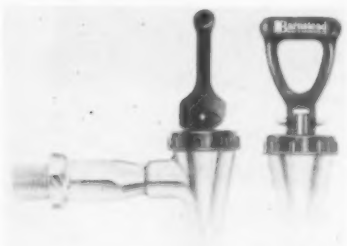
Cross-Bore



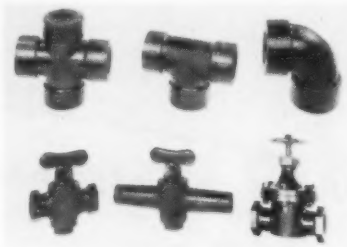
More Cross-Bore

E—904. For Both Heating and Cooling—A new type of impervious graphite heat exchanger is being used successfully by Michigan Plating & Stamping Co., for both heating and cooling nickel plating solution.

This new heavy duty exchanger is designated the "Cross-Bore." The one in use is a single pass unit with 21.2 square feet of transfer surface, (Model CB-6). It features simple, heavy duty construction, consisting of only 3 parts: (1) "one-piece" fully floating impervious graphite heat transfer cylinder, (2) "one-piece" header domes, and (3) shell with required nozzles and mounting brackets. During actual plating operations, this same exchanger is used to cool the bath.



Sn Lined Faucet



P, S, and N Lines

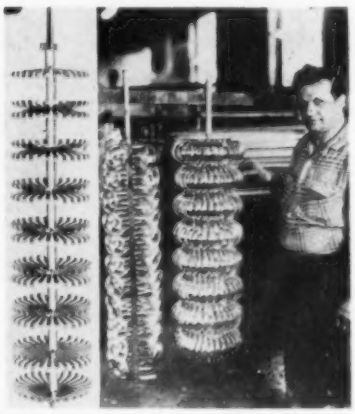
E—905. Tin-Lined Faucet—Barnstead Still & Demineralizer Co. announces a new type of tin-lined faucet for distilled water distribution systems in laboratories and hospitals. The manufacturer claims it will give long trouble-free service with complete purity protection. Barnstead specifications show that the faucet is both self-closing type and nonself-closing type depending on which way the handle is thrown. This feature eliminates the problem of leakage, binding, dripping, regrinding etc., which are encountered with distilled water taps that rely on ground joints for tightness.

E—906. Os and W—Dalic Metachemical, Ltd. announces that osmium and 95 per cent pure tungsten can be deposited from the Dalic Process.

E—907. PVC, Styrene-Copolymer and Buna N Pipe and Fittings—Vanton Pump & Equipment Corp. Division of Cooper Alloy Corp., announces the availability of three new lines of plastic pipe, fittings and valves. These products are available in PVC (unplasticized, unmodified Polyvinyl Chloride), Styrene-Copolymer and Buna N materials and will be marketed as three separate lines known as "P" Line, "S" Line and "N" Line, respectively. "P" Line (PVC) pipe and fittings offer outstanding chemical resistance, are light in weight, nontoxic and nonflammable. "S" Line (Styrene-Copolymer) pipe and fittings are exceptionally tough with high impact strength. These too offer broad chemical resistance and are noncontaminating to food products or sensitive chemical solutions. "N" Line (Buna N) pipe, fittings and valves enable the handling of many organic, as well as inorganic, solutions at elevated temperatures up to 225° F.

E—908. Anodizing Rack—A newly designed anodizing rack, announced by Service Products Co. can be completely assembled without tools in the plant to handle any job and is said to increase holding capacity as much as 6 times over standard racks.

With simple component parts, it is possible to arrange the rack in hundreds of different ways to accommodate most shapes and sizes. This same flexibility of arrangement is particularly valuable in minimizing the amount of space that must be devoted to the storing of special racks. A reasonable stock of parts will permit any shop to make up special racks quickly, making obsolete all special racks stored for re-runs.



Flexible Holders

Still another important advantage of the rack is its labor economy.

In de-racking, too, it is possible for Service-Rack to save sufficient time to pay for itself rapidly. In order to de-rack, it is only necessary to remove the locking wedges and simply shake the rack. In a matter of seconds, the load can be completely de-racked into a water bath. It is absolutely unnecessary to remove parts individually.

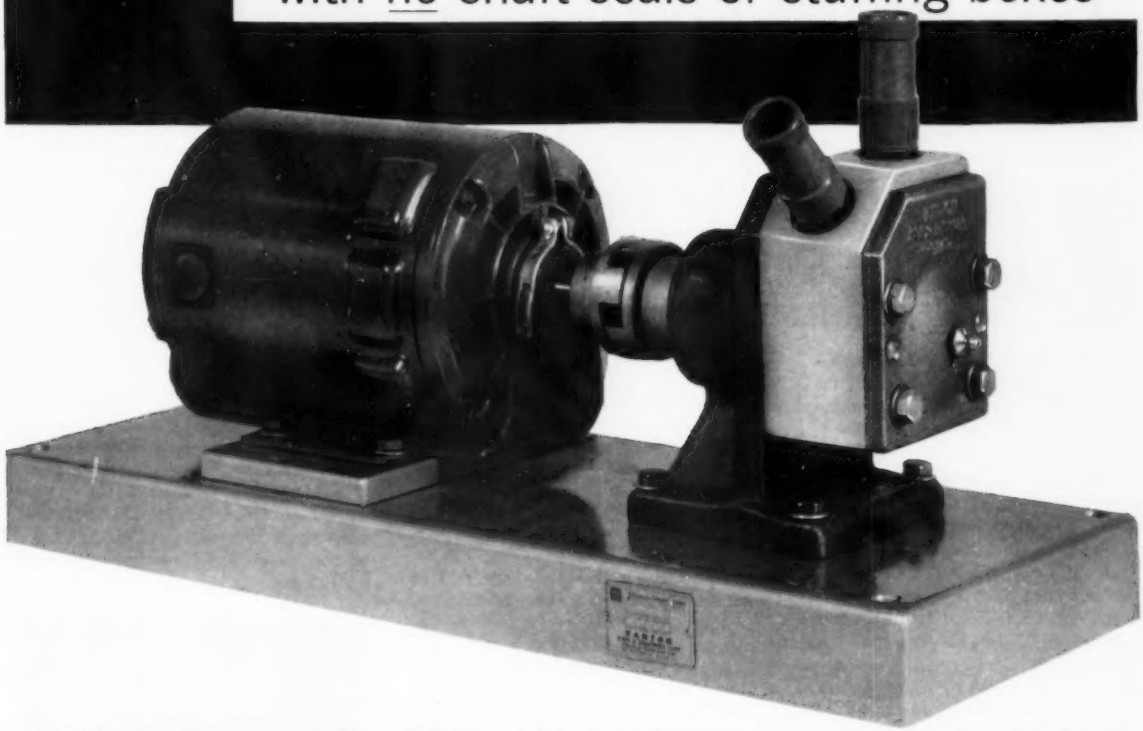
E—909. Leather Work Glove—A new line of industrial gloves featuring a new leather with exceptional wearing qualities has been announced by the Wearhide Glove Co. Tests by independent testing laboratories indicate that this leather, known as horsebutt split leather, gives up to three times as much wear as other work glove leathers.

The gloves are extremely flexible for complete freedom of movement due to a special tanning process. This process also retains the tremendous resistance to abrasion found in the natural shell cordovan horsehide from which the glove leather is split.

the VANTON Plastic "Flex-i-liner" pump

the only (repeat-ONLY) plastic rotary pump

with no shaft seals or stuffing boxes



Costly leakage and metal contamination are no longer problems

. . . for here is a pump truly designed for the plating industry. The unique "flex-i-liner" design eliminates stuffing boxes, shaft seals, gaskets or check valves. Fluid contact is limited to the inner surface of a plastic housing and outer surface of a durable plastic or synthetic flexible liner.

"Flex-i-liner" pumps are ideal for handling such plating solutions as: Brass, Cadmium, Copper, Gold, Nickel, Rhodium, Silver and Zinc, as well as Chromic, Hydrochloric, Sulfuric and other acids found in plating rooms.

Self priming with a gentle, non-shearing pumping action, Vanton "flex-i-liner" pumps are available in capacity ratings from ⅓ to 20 gpm and can be furnished direct connected to constant or variable speed motor equipment. Vacuums up to 26" Hg. are developed.

HOUSINGS: Available in Polyethylene, Buna N, PVC, Bakelite.

LINERS: Available in Neoprene, Buna N, Gum or Natural Rubber, Hypalon, Vinyl or Compar.

Bulletin VP563 on request.

VP

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HAVEG® News

Wherever CORROSION RESISTANCE is a Factor

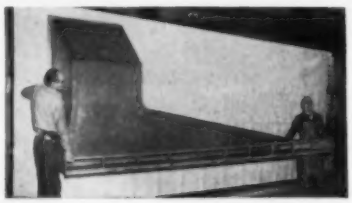
HAVEG PLASTIC TANKS MEET EVERY SERVICE REQUIREMENT

HAVEG STORAGE TANKS, REACTORS, COLUMNS, TOWERS, PLATING TANKS, FILTERS and similar equipment are now manufactured in every type and size, rectangular and cylindrical—in a wide range of Haveg grades, combined with selected chemically inert materials to provide exceptional resistance to corrosive acids, hypochlorites, salts, alkalies and various oxidizing agents.

HAVEG PLASTIC TANKS are tough and durable. Large Haveg storage tank installations have been in continuous service at leading processing plants as long as twenty-five years—under the most extreme corrosive conditions.

HAVEG TANKS are economical to install . . . easy to maintain. **NEW POLYESTER GLASS** constructions, for example, *cost considerably less installed than lead or rubber-lined, stainless or even mild steel types in many instances* . . . offer bonus savings in reduced steel for support because of their extreme light weight! Haveg plastic tanks require no painting or costly maintenance . . . can be readily field repaired where necessary.

Whether yours is a new or replacement installation, investigate the advantages of Haveg corrosion resistant plastic tanks and process equipment for your process operations. Write for Bulletin C-13.



HAVEG FUME SYSTEMS, CORROSION RESISTANT PROCESS EQUIPMENT

Haveg fume duct, hoods, stacks, fans and fittings in the Haveg reinforced plastic best suited to handle the corrosive fumes and gases at your plant, offer the most practical and economical system possible wherever fume removal is an operational requirement.

Engineered for use up to 350°F., Haveg fume removal units are light in weight for easy, low cost installation, or for heavy duty service where required. Hoods are readily molded and joined in varying shapes and sizes . . . stacks up to 12 foot diameter and over 200′ high can be flanged for quick assembly—or resin-welded as a single unit! Complete fittings are available from stock, or can be custom-fabricated to your specific requirements. A Haveg engineer will be glad to assist you in planning a complete system for your plant . . . or selecting Haveg units to replace deteriorated apparatus in your present system.

You can make anything in Haveg that you can make from metal. Haveg is tough, durable, machineable, easily and quickly altered or repaired in the field.

Haveg Bulletins F-7 and C-13 give detailed data on the complete line of corrosion resistant Haveg process equipment and resin cements to solve *every* corrosion problem. Write for your copies at no obligation.

H-604

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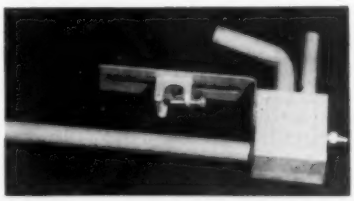
EQUIPMENT & SUPPLIES

Two-Tubes

E—910. Epoxy Resin Kit—A new development utilizing the outstanding bonding properties of epoxy resins is the Epoxy Adhesive Kit now being produced by Houghton Laboratories, Inc., of Olean, N. Y. This new kit is designed for use in the field and contains the exact required proportion of resin and hardener in two flexible tubes. Complete instructions are inside the kit.

E—911. Constant Level—A new, highly accurate, and low-cost level control for plating baths, impervious to plating acid deterioration or "build-up," has been introduced by Elkhart Controls Co. Called the Eltemp Level Control, this simple unit efficiently maintains a constant level with no danger of mechanical or electrical failure.



No Build-up

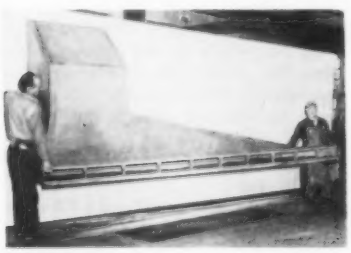
The Eltemp Level Control is entirely different in appearance, materials, and design from any other level control now on the market. Its entire body is constructed of either Uscolite or a combination of Uscolite and Teflon. Utilizing their excellent chemical resistant properties and stability at high temperatures, the Eltemp has a 36-inch fill tube which adds water as needed at the bottom of the tank, maintaining the solution level within a tolerance of plus or minus three eighths of an inch. Tanks must be at least three feet deep for proper operation. The new device puts to practical use the natural law of pressure difference. A small stream of water flowing into the Eltemp Level Control automatically assures a constant level for all solutions of a specific gravity of 1.140 or heavier.

EQUIPMENT & SUPPLIES

Ultrasonic Power Unit

E—912. High Power Magnetostriction Transducer—Johnson & Johnson engineer, Morris Schwartz (left) is seen examining the first high-power magnetostriction transducer, designed specifically by Acoustica Associates, Inc. for large scale ultrasonic cleaning, degreasing, descaling, plating and other metalworking and finishing operations. This 400 watt, 25 kilocycle transducer can be grouped externally on existing process equipment and driven in tandem by electronic or rotary driven above audible frequency generators ranging in power from 2000 to 150,000 watts. It can be used with liquids at temperatures far above boiling point, thus overcoming limitations inherent to barium titanate transducers.

E—913. Corrosion Resistant Hood—This corrosion resistant fume hood, 12½-feet long, is easily lifted by two men. Stronger and far more rigid than a hood of metal several times this weight, (it weighs only 178 pounds), this polyester reinforced glass hood is also claimed to provide far greater corrosion resistance.



Feather Light Fume Hood

It is used to handle strong acid fumes from electroplating. This is one of several polyester glass ducts recently introduced by the Haveg Corp. of Wilmington, Del. Costs are claimed to be substantially less than stainless steel and service life several times greater.

BRIGHT FINISH CADMIUM AND ZINC PLATING AT LOW COST!

Cadmax and Zimax, Federated's new addition agents for cadmium and zinc plating baths, eliminate dull, frosty finishes . . . and do it at low cost!

Cadmax for cyanide cadmium plating produces clear, brilliant, blue-white deposits, prevents burning, minimizes staining, does not foam, and is easy to control. An adjuster solution, furnished free with Cadmax, eliminates breaking in the bath, gives perfect plating from the first load.

Zimax for zinc plating produces clear, bright deposits, increases covering and throwing power, and is much more economical to use than similar materials. It is available in powder or liquid form; for barrel or still brightening. It usually may be added without conversion treatment to any zinc solution using a proprietary addition agent.

Experienced laboratory and field personnel are available to give complete technical service, including solution analysis and recommendations. Call or write to Federated's Plating and Electrochemicals Department; or get in touch with your nearest Federated dealer.

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EQUIPMENT & SUPPLIES

E—914. Chrome Sealer—A new chrome sealer, Kenvert No. 32, especially designed to eliminate "spotting-out" on thin copper and brass plate is now being manufactured by the Conversion Chemical Corp., Rockville, Conn. Kenvert No. 32 is also highly recommended for sealing in copper, brass and porous castings without attacking the metal as well as preventing staining and fingerprinting prior to lacquering. It offers excellent adhesion to lacquer films and improves their low properties and coverage. In many instances, the extra lacquer mileage obtained more than saves the treating cost involved if no other factors are taken into consideration.

E—915. Canopy Hood-Exhaust Duct—The Pittsburgh Plate Glass Co., Milwaukee, utilizes this canopy type hood and exhaust ducting system, made entirely of corrosion resistant polyethylene, in its plating room as part of a comprehensive ventilating system.

The hood is set over a tank in which metal parts are dipped in an acid bath for cleaning prior to plating. The fumes, which are given off from the cleaning solution, rise into the hood, are then exhausted through the ducting into the outside atmosphere.

Fabricated by the American Agile Corporation, the black polyethylene ducting has a cross-section thickness of ¼ inch; flanges are of ½ inch material. The cylindrical shapes are centrifugally cast of polyethylene pigmented modified powder; the elbows feature hot gas welded construction.

Zippy Peeler

E—916. Coating For Spray Booths—A new vinyl plastic protective coating that can be sprayed or brushed on spray paint booths is announced by Klem Chemicals, Inc.

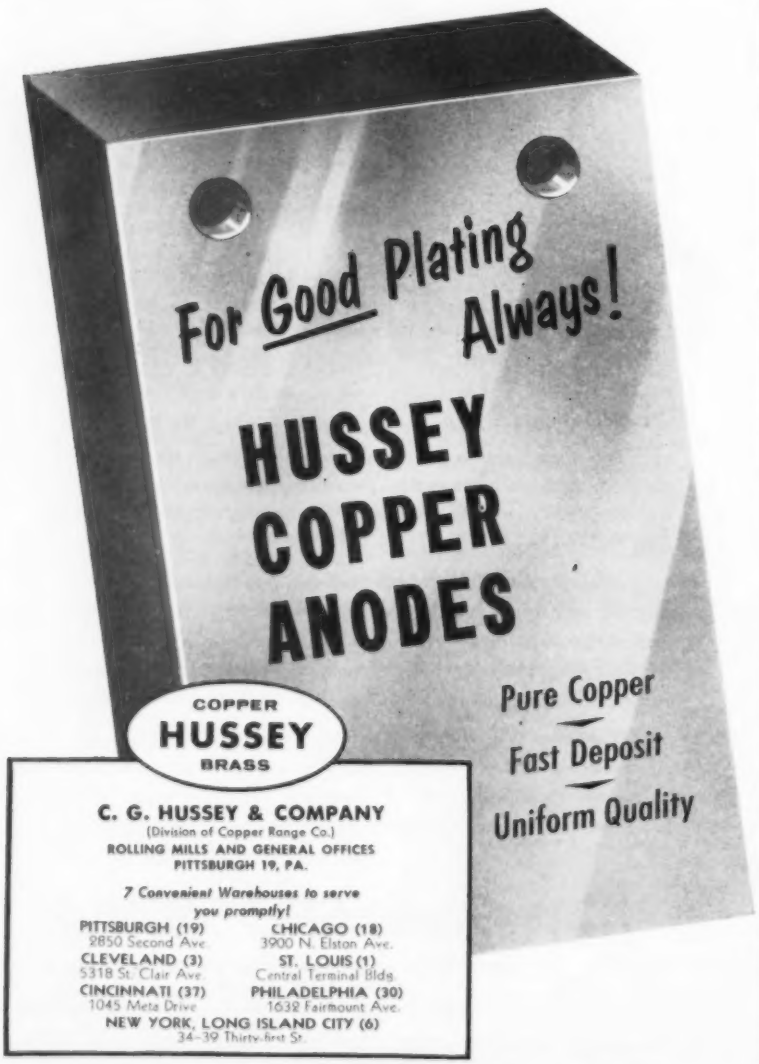
The new product, named "Zip Kote," can be peeled off, removing paint deposit with it and leaving the booth clean.

It offers several other advantages. (1) It dries extremely fast. (2) It is white in color, providing reflective light in the booth. (3) It will not support combustion when dry. (4) It has unusual tensile strength, peeling off in large sheets and speeding the job. (5) It does not lose its elasticity even when subjected to heat as high as 290° F for a long period.

E—917. Mirror Bright Silver—The new Silvrex bright silver plating process, introduced by Sel-Rex Precious Metals, Inc., is said to give a mirror bright finish directly from the bath through a complete range from flash to extra heavy deposits.

Other features of the new process are: hard (Brinnell 135) and ductile deposits; operates at room temperature—less fumes, less tendency toward bath decomposition; noncritical, economical operation and control—operable in a wide range of current densities—from 10 to 40 amp/sq ft; and exceptional throwing power affording uniform thickness of plating even in "blind holes" and crevices.

E—918. A Compound and a Cleaner—Apothecaries Hall Company has just formulated a new burnishing compound—to be known as Ahco Burnishing Compound No. 44—for use in conventional types of tumbling equipment to produce a bright finish on steel and nickel parts. This new compound is said to provide not only the high lubricity and cushioning action required for good burnishing, but it also leaves parts clean and bright without objectionable residues. Ahco No. 44 contains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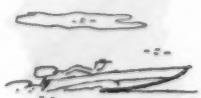

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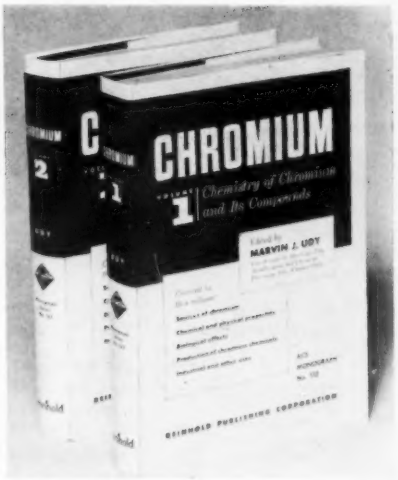

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MARVIN J. UDY is widely known for his process development work in chemical and metallurgical fields. His process for cadmium plating formed the basis of the Udylite Process Co. of Detroit. For several years he investigated and commercialized a process for the electrodeposition of chromium and chromium plating. He has also developed a process for treating low-grade chrome ores which has resulted in a complete line of exothermic ferroalloys and metals. These and many other chemical and technological achievements eminently qualify Udy to supervise the preparation of this exhaustive reference work.

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REPORTS FROM ALL OVER . . .
STRIPPED, CLEANED, DEGREASED

Sulfuric acid, familiar to ancient man, is still widening its uses. The 14 million tons per year presently being produced is increasing. A good example of that trend is **Garfield Chemical and Mfg.** (jointly owned by **American Smelting and Refining** and **Kennecott Copper**). They are expanding sulfuric acid output to 1100 tons per day by putting up their fifth plant in Garfield, Utah.

It has been reported that the **Japanese Ministry of Trade** has discontinued licensing exports of a number of nonferrous metals and ores—including zinc, antimony and nickel. Since a large amount of the nickel which has been used by the plating industry has been received from Japan, it appears that nickel may become more acute in the future.

Metal whiskers are generated mainly by a glide mechanism. The frequency with which the whisker generating dislocations operate depends on diffusion. This is the theme of an article by *J. Franks* in which metal whisker formation is covered somewhat more exhaustively than heretofore.—According to *N. Murphy* of **Virginia Technical Institute,** the aluminum plated can will replace the tin can within three years because of a new method of plating aluminum on steel. The method was developed at VTI. The new process is said to be faster, better and uses a more stable bath than any present method.—To retard evaporation of liquids in open tanks and vessels, **American Agile Corp.** has introduced "little pillows" of polyethylene to function as small floating tank covers. A 1½ inch layer is considered effective.—Titanium plating on less valuable metals is being studied in an attempt to develop corrosion resistant finishes, according to an article which appeared in **American Machinist** recently.—**Iron Age** has prepared a glossary of metal cleaning and finishing terms.—Electron microscope work by *J. Menter* of **Tube Investments Research Lab.** of Cambridge, England has given visual proof of defects in the crystal lattices of metal compounds. This important information may lead to a better understanding of metal surface weaknesses, plate adherence, corrosion, etc.

Dressing grinding wheels with cemented diamond particles will result in expanded use of diamond dressing in grinding and in replacement by grinding of some machining operations.—Removing grinding wheel dust by setting up an air curtain around the work-rest and the open portion of the guard is a new Italian device on a battery of dual grinding wheels which consists of a tubular iron frame provided with small holes on three sides through which a jet of compressed air is sent at suitably regulated pressure.

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Lea Mfg. Company of England, Ltd., Buxton, England
Lea Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

Are you interested in Plating Specialties? **SEE THE OTHER SIDE OF THIS INSERT.** ➡

the "Nickel Twins"

★ One works **HOT**

★ The other works **COLD**

Are you barrel plating? Getting the brightness you want? The ductility? Good subsequent chrome coverage? Our research department has developed two 'effective' brighteners for BARREL nickel plating, each with distinctive characteristics:

L-R NICKEL GLEAM

(for *high temperature* operation)

- ★ **Rapid deposition**
- ★ **Exceptional brilliance**
- ★ **Excellent chrome coverage**
- ★ **High tolerance to metallic impurities**
- ★ **Outstanding ductility**

L-R NICKEL-GLO

(for *room temperature* operation)

- ★ **Normal deposition rate**
- ★ **Attractive lustre**
- ★ **Single addition agent, no organics**
- ★ **All the NICKEL-GLO plates out**
- ★ **Non-critical operation; minimum control**

The hundreds that are using Lea-Ronal Plating Processes know and appreciate the high standards that have been set by L-R. These two Brighteners . . . NICKEL GLEAM and NICKEL-GLO . . . offer the same high quality and effectiveness. Why not send for a trial sample of either or both? Make your own comparison. You'll find the results good.

Lea-Ronal Inc.

Main Office and Laboratory:
139-20 109th Avenue, Jamaica 35, N. Y.
Manufacturing Plant:
237 East Aurora Street, Waterbury 20, Conn.

The
LEA GROUP
serving the Finishing Field
Lea-Ronal, Inc., Jamaica, N. Y.
Lea-Michigan, Inc., Detroit
The Lea Mfg. Co., Waterbury, Conn.
Lea Mfg. Co., of Canada, Ltd.
Lea Mfg. Co., of England, Ltd.
Plating Polishing Buffing Burring

Are you interested in Buffing, Polishing and Burring Specialties? SEE THE OTHER SIDE OF THIS INSERT.

LOOK! they're brand new and BARGAIN PRICED!

Belke Ready-Made "ECONOMY" RACKS*

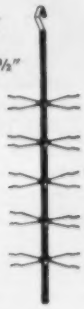
100% COPPER Spines . . . Bronze Tips!
All Coated with Universal Plastisol!

- all racks are 30" length except Style H which is 8⅝" long
- distance from hook to first tip is 9½".

You get "can't be made better" quality that has made the Belke brand famous throughout the years, and at prices SO LOW you can't make racks like these yourself for less! Why? Because Belke has "tooled-up" to produce these "Economy" racks in huge quantities . . . and that means worth-while savings that go directly to you! The proof is found in the price! Yes, and here's more good news: Belke intends to carry a large stock on hand to give you IMMEDIATE DELIVERY!

These racks are designed for a large variety of pieces, and for ready availability at low cost when you need racks in a hurry!

STYLE A
diameter—.114"
tip width—6½"
distance between tips—2¼"
$5.78



STYLE B
diameter—.114"
tip width—7½"
distance between tips—4½"
$4.77

STYLE C
(heavy riveted only)
diameter—1/16"
tip width—4½"
distance between tips—2¼"
$6.00

STYLE D
diameter—.093"
tip width—6½"
distance between tips—2¼"
$5.83

STYLE E
diameter—.093"
tip width—6½"
distance between tips—4½"
$4.42

STYLE F
diameter—1/16 x ½"
tip width—7½"
distance between tips—4½"
$5.84

STYLE G
diameter—1/16 x ½"
tip width—7½"
distance between tips—4½"
$5.69

STYLE H
6 holes—2" apart
$2.45

(charge of 25c for 6 holes drilled and tapped, screws furnished.)

- *prices subject to change without notice.*
- *for lots of less than 12 racks: slight additional packaging charge of $1.50 per shipment*

You get "can't be made better" quality that has made the Belke brand famous throughout the years, and at prices SO LOW you can't make racks like these yourself for less! Why? Because Belke has "tooled-up" to produce these "Economy" racks in huge quantities . . . and that means worth-while savings that go directly to you! The proof is found in the price! Yes, and here's more good news: Belke intends to carry a large stock on hand to give you IMMEDIATE DELIVERY!

These racks are designed for a large variety of pieces, and for ready availability at low cost when you need racks in a hurry!

HERE'S WHY BELKE "ECONOMY" RACKS ARE BEST:

- ***ONE PIECE ALL COPPER SPINES—not part iron—part copper frames!***
- ***FULL AMPERAGE right to the part results in better plating!***
- ***ALL TIPS are riveted and soldered or brazed for continuous conductivity and rigidity!***
- ***ALL CONTACT WIRE TIPS are Phos. Spring Bronze!***
- ***100% SOLIDS PLASTISOL INSULATION resistant to ALL plating cycles . . . the best money can buy!***

CUSTOMER COMMENTS:

"These ECONOMY racks cost so little that they pay for themselves in about a week!"

"You should have made racks like these 30 years ago."

"They fit so many jobs and cost so little I can't afford to be without them."

"I don't see how you do it — they're certainly low priced."

"I know a bargain when I see one — send my order at once!"

"If I use them 50 times they're paid for."

"Even if I break some tips, I can well afford to throw them away — my investment is so small."

send your order direct or write for name of your local representative.

Belke MANUFACTURING CO.
EVERYTHING FOR PLATING PLANTS
947 N. Cicero Ave., Chicago 51, Ill.

you expect top quality from Belke . . . . and you get it!

*"Economy" rack tips are rigidly fastened to spine and do not afford the features found ONLY in the Belke THINKER BOY racks with replaceable tips.

◀ INDICATE B 903.

no cyanide, chromate, or similar toxic material.

Apothecaries Hall Company has also just announced a new metal cleaning compound (Ahcoloid Cleaner No. 210) for descaling or derusting steel and iron parts without attacking the sound base metal significantly. According to the manufacturer, the new cleaner is well suited for treating small parts in tumbling barrels.

E—919. Air Control Valve—An improved model of its Ventomatic Air Control Valve for increasing the efficiency of air suction systems and dust collectors has been announced by The Kindt-Collins Company, Ohio.

Ideal for use on such units as metal grinding and polishing machines, wood joiners, sanders, table and band saws, and other machines producing dust, shavings, or lint, the Kindt-Collins Ventomatic Air Control Valve has been improved to increase durability and performance.

The valve has two outstanding features: 1) it operates automatically, concentrating the suction of the collector only at the machines in operation, thereby improving efficiency, and 2) it presents an absolutely unobstructed passage for the air stream when open, entirely eliminating clogging.

E—920. Acid Additive and Fume Depressant—A new wetting agent and emulsifier developed for use as a rust preventive and corrosion inhibitor for steel is also effective as an acid fume depressant in the pickling bath.

The new product is called Akweons No. 674 and is designed to be added to any sulfuric, hydrochloric or phosphoric acid pickling bath solution. It is reported to be readily soluble in acid, alkaline or neutral solutions as well.

Originally designed as a rust preventive and as a retardant to acid attack on the base metal during the steel pickling process, the new wetting agent has shown good results in helping to suppress fumes during the process.

E—921. Sealed Switch—A sealed, roller plunger, high-capacity switch that will handle inrush currents as high as 75 amperes has been introduced by Micro Switch of Freeport, Ill., a division of Minneapolis-Honeywell Regulator Company.

The switch (designated BAFI-2RQN8) is made oil-tight by special integral O-rings around the bushing and plunger and a ring-type seal between the cover and the housing. Other features include an actuator that is field adjustable through 360 degrees to allow operation from any direction; a rugged, corrosion-resistant, long-wearing steel roller, and a heavy plunger bushing.

E—922. "Before" and "After" Burnishing—Shown is a "before" and "after" photo of steel cabinet parts burnished with Wyandotte Burnek-452 by a large manufacturer of plated cabinet and building hardware. This firm is one of several which has already adopted this newly introduced Wyandotte product.

With a New Compound

Users report Burnek-452 to be dual purpose—effective for both cleaning and burnishing. Residual compound acts as a temporary rust preventive. Field tests and plant use show Burnek-452 to be nonfoaming even at 2 oz/gal concentrations. The product is nondusty and develops high luster in minimum operating time in either hard or soft water.

A Special Technical Bulletin is available on Wyandotte Burnek-452. It is marketed in 400-lb and 125-lb steel drums.

E—923. Burnishing Compound—A new alkaline burnishing compound for zinc die castings has recently been introduced by Oakite Products.

Oakite FM 186 is an alkaline liquid compound which may be used for self-tumbling or with shot or synthetic media. Recommended concentration of the solution is 1 to 2 per cent by volume. Its use is said to produce a brighter finish and to improve the color of zinc die castings. It is also recommended for burnishing steel and copper and its alloys.

America looks to . . . Hammond for FINISHING and DEBURRING "KNOW-HOW"

The experience gained in over 70 years of machinery building has provided us with a big bank of "Know How."

This knowledge is drawn upon and added to every day. Our business is to share it with you to bring down high finishing costs. Many users of Hammond Automatics have found more efficient means of finishing by drawing on our bank of "Know How."

The Rotary Automatic illustrated represents one of our many types and sizes of automatic finishing machines for either continuous rotation or indexing. The head and stand units shown are a part of a large "family" which range in type and size up to 20 HP.

SEND SAMPLES and we will show you how much you can speed up production and cut costs.

Hammond Machinery Builders INC.

1613 DOUGLAS AVE. • KALAMAZOO, MICH.

"See us at Booth No. 1250 Metal Show, Cleveland—October 8-12"

Tannery calls Merchants' Milwaukee office. A large order of assorted chemicals is needed immediately. Products of six different manufacturers are included. Can Merchants make rush delivery?

184-piece order is made up from stock at Merchants' adjoining warehouse. A large inventory is maintained to fill customers' daily needs.

rush order:

TEN TONS OF ASSORTED CHEMICALS

Delivery is made an hour and 30 minutes from the time order was placed. Ten tons, 184 pieces — delivered immediately from a *single source!*

Merchants makes delivery in an hour and a half!

Each Merchants' office is a single, reliable source for a wide assortment of chemicals. Because stocks at Merchants' warehouses are maintained with one consideration in mind — customer service — orders for assorted chemicals are filled rapidly and completely. For 35 years Merchants Chemical has given industrial chemical users this type of specialized service. Products include acids, alkalis, fungicides, surfactants, chlorinated solvents, emulsifiers, laundry compounds, soaps, dry ice and chemical specialties.

SERVICE QUALITY MERCO

MERCHANTS CHEMICAL COMPANY, INC.

60 East 42nd Street, New York 17, N. Y.

SALES OFFICES AND WAREHOUSES: CHICAGO • CINCINNATI • DENVER • LOUISVILLE • MILWAUKEE • MINNEAPOLIS • NEW YORK • OMAHA

STOCK POINTS: ALBUQUERQUE, N. M. • ERWIN, TENN. • S. NORWALK, CONN.

DO YOU NEED ANSWERS TO THESE QUESTIONS?

1 How can I electroclean steel at lower cost?

2 How can I find a brass cleaner that gives better protection against tarnishing?

3 How can I reduce rejects due to faulty electrocleaning of zinc die castings?

***Answer* 1** Following an Oakite recommendation, one plater made a small change in his steel-cleaning cycle and soon had two tankfuls of cleaning solution doing the work of three—and the plate adhesion was improved. *See booklet offered below.*

***Answer* 2** Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current. *See booklet offered below.*

***Answer* 3** Oakite has an anodic conditioner that offers brighter plating of zinc die castings . . . with no anodic blackening and fewer rejects. *See booklet offered below.*

FREE For more information about the electrocleaning of steel, brass or zinc die castings, send for one or all of the booklets listed in the coupon.

four good steps toward better electroplating on steel
NEW
Good news about electrocleaning zinc-base die castings
OAKITE

Technical Service Representatives in Principal Cities of U. S. and Canada

OAKITE PRODUCTS, INC.
40 Rector Street, New York 6, N. Y.

Send me the free booklets I have checked below:

☐ "Four good steps toward better electroplating on steel"
☐ "What's NEW for electrocleaning brass and other copper alloys"
☐ "Good news about electrocleaning zinc-base die castings"

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Company.....

Address.....

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TWENTY-FIVE YEARS AGO

"In reviewing the list of speakers at the Educational Sessions during the Rochester Convention, it was noticeable that with only a few exceptions, the men who read papers were, for the most part, technically trained and were not actively engaged in the real work of taking charge of plating and finishing departments. It is a splendid tribute to the AES to have such men keenly interested in the growth and development of our organization. A great amount of study and research is necessary in the preparation of the papers presented, and we would be ungrateful indeed if we showed any lack of appreciation for such unselfish service." So starts the editorial in the September 1931 issue of MONTHLY REVIEW. It goes on to decry the fact that we are perhaps neglecting to use the practical men who have the everyday plating room problems to solve. How little things have changed in twenty-five years! Theodore J. Zak has an article in this issue, "The Use of the Compensating Colorimeter in the Electroplating Industry." This article carries an excellent explanation of *p*H and its derivation and meaning as well as uses. The Editor saw fit to use an entire page to ask Branch Secretaries to send in Branch News reports by the twentieth of each month. This, too, is a situation that persists. However, a quarter century ago, in the stultifying days of dreary economic depression, the AES showed a remarkable élan. There are announcements of mimeographed copies of analyses of solutions issued by the "Bureau of Education"; there is a description of the ASTM-AES Specifications and Standards work; the Philadelphia Branch reports of a summer meeting of the officers which concluded, "Philadelphia, through its officers, is already at work on the convention and, depression or no depression, intends to make this convention the most instructive and best attended convention in the history of the AES." Here was an indomitable spirit, a looking-ahead, an abiding faith in the industry, the members and their ability.

TEN YEARS AGO

By way of contrast, the September 1946 issue of MONTHLY REVIEW looks like a magazine that was published simply because it had to be; it was the monthly custom. It does contain 55 pages of advertising which amounts to approximately half of the total issue. There is no editorial! Perhaps the most significant announcement in the issue is that Allan Ray Putnam has joined the staff as Advertising Manager. Could this imply a jarring reorganization? Surely, the poverty of spirit, content and make-up of the September 1946 issue is indicative of internal confusions—the most weakening thing that can befall a publication.

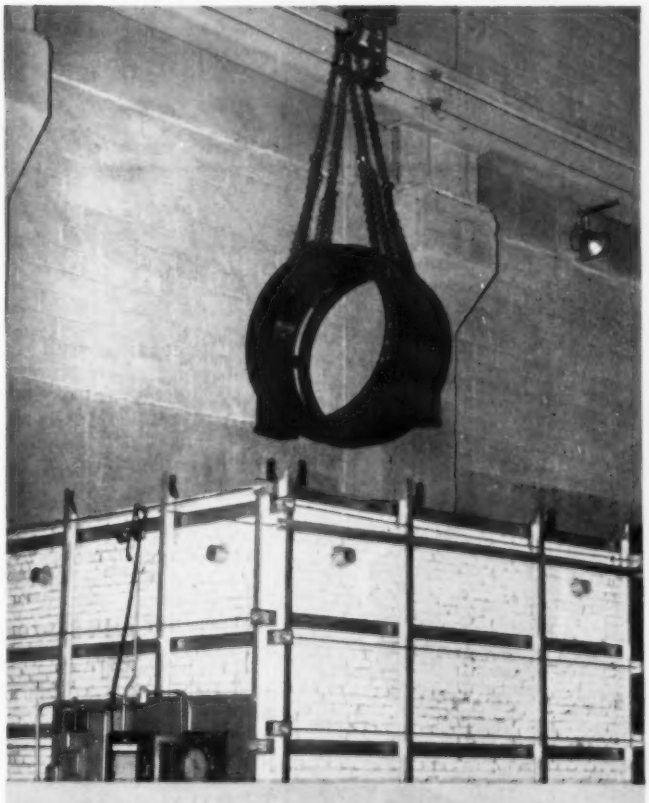
Hot Time...

assures you a long-time trouble-free source of low-voltage dc power

Chandeysson

NORMALIZES COLD-ROLLED FRAMES AND WELDS BY SPECIAL ANNEALING

This massive Chandeysson generator frame is being lowered into a specially designed furnace for heat treating. This annealing stress-relieves the cold-rolled steel frame and all welds. Superior and uniform electrical characteristics result in sparkless commutation, lower brush wear, and higher efficiency . . . even after years of rugged use. The most modern manufacturing methods are used in every step of making a Chandeysson Motor Generator. Unified responsibility for the manufacture of every component . . . from selected raw materials to the finished product . . . is in the hands of skilled men with decades of experience in building low-voltage generators. Our aim in engineering is to *prevent* design defects . . . rather than to correct for them. This is why more and more "Industry Leaders Choose Chandeysson!"



MAKE US PROVE to you that a Chandeysson Motor Generator set is your most economical and dependable source of low-voltage dc current. Mail this coupon today.

CHANDEYSSON ELECTRIC COMPANY
4078 Bingham Avenue, St. Louis 16, Mo.

Please send bulletin D-101

Name.....Title.....

Company.....

Address.....

City.....Zone....State.....

CHANDEYSSON ELECTRIC COMPANY • 4078 Bingham Avenue, St. Louis 16, Mo.

EQUIPMENT & SUPPLIES

E—924. Sprayer—A new and effective spray cleaner and degreaser for engines, outboard motors, grilles, fans, floors, textiles and other surfaces soiled by grease or oil is being produced by Krylon, Inc.

The new Krylon spray cleaner and degreaser cuts down both the cost of maintenance and the speed and efficiency of removing grease and oils from any surface. After application, deposits then may be rinsed away with water.

The new Krylon product, which comes in the new giant 16.2 ounce aerosol container, merely requires pressure on the nozzle of the can. An even spray of cleaner and degreaser covers every inch of the surface to be cleaned. A complete rinsing water will leave a completely clean surface.

E—925. Safe Plating Wastes—Paddock Pool Equipment Company, Van Nuys, Calif., introduces a new line of chemical feeders for conversion of poisonous wastes into neutral fluids.

Concentrations of chromium, cyanides, acids, and other poisonous substances must be neutralized before discharge to waste. Otherwise, sewage treatment plants cannot perform their duties and there is danger of stream or ground water pollution. While there are many partial solutions to this problem, Paddock offers one of the simplest and least expensive solutions for the smaller plant.

Although normally used as hypochlorinators, these new Paddock feeders can easily introduce appropriate neutralizing chemicals into the waste line at any desired rate up to 12½ gal/hour. They are adjustable to various flows and concentrations and operate automatically by electric drive. Painstaking testing shows that they maintain an accurate, metered feed with little attention other than replenishment of the chemicals.

For this reason, they may also be used in feeding solutions at a predetermined rate to hold the plating bath itself at the proper balance and prevent variations in the final product.

E—926. Pure Water for Plating Baths—Pitting and spotting, with consequent high ratio of rejects, may be caused by impurities in the water supply for the plating bath. Low cost protection against this common problem is offered by Paddock Pool Equipment Company, Van Nuys, Calif.

Where pure water is vital, Paddock's new line of diatomaceous earth filters completely removes all suspended matter at flow rates up to 1800 gal/hour. A measure of this new "DS" type filter's effectiveness is indicated by the fact that the diatomaceous earth on the filter element presents approximately 2,500,000 filter openings per square inch. Even the smallest particles of solid matter cannot pass through.

Paddock's filter element is a single spiral of non-ferrous metal, fitted on the exterior surface with orlon filter cloth. Diatomaceous earth adheres to the entire surface of the cloth and provides super-fine filtering. No backwashing is required to clean this filter. Simply remove the quick-opening lid and hose off the filter element.

E—927. Stressed Nickel For Rhodium—A new nickel plating process developed by Sel-Rex Precious Metals, Inc. specifically for use with their bright rhodium, is said to produce super, hard and ductile, compressively stressed nickel coatings. Known as Lectro-Nic, the new process counteracts rhodium electroplate's inherent tendency to cracking and peeling, when used as an undercoat.

E—928. Chrome Sealers—Two new chrome sealers for improving the appearance and protection of zinc die castings without plating are now available from the Conversion Chemical Corp. They are Kenvert No. 50 and Kenvert No. 51. According to the manufacturer, Kenvert No. 50 is designed to insure bright, clear finishes, excellent corrosion protection and is highly resistant to fingerprinting and staining. By varying the cycle or concentration of the solution bright iridescent or a golden brown color can be produced.

Where it is desirable to produce a greenish gray to olive drab film on zinc castings, Kenvert No. 51 is recommended. This protective coating can be produced in a highly stable bath which is uniformly reproducible, offers maximum corrosion protection and is a good base for paint.

Why TEMCO Assures Anode Quality

Processing and fabricating pure electrolytic copper has been our business for over 40 years. In that time TEMCO has developed specialized facilities and skills that have gained for our products a standard of unsurpassed excellence and purity.

TEMCO Copper Anodes are made from electrolytic wire bars that are 99.92% pure. Copper is processed in our own mill and anodes are cast or forged in our own integrated shops.

The use of pure copper and the unusual centralization of facilities assures control and maintenance of our high standards throughout production.

Whether cast, forged or hot rolled, TEMCO anodes have certified purity and possess most favorable density characteristics for copper plating.

Important, too, is our established policy of faithfully and impartially serving all our customers at all times.

Ask to have our representative or nearest distributor call. For additional information, write direct, stating your requirements.

THE ELECTRIC MATERIALS CO.
NORTH EAST, PENNSYLVANIA

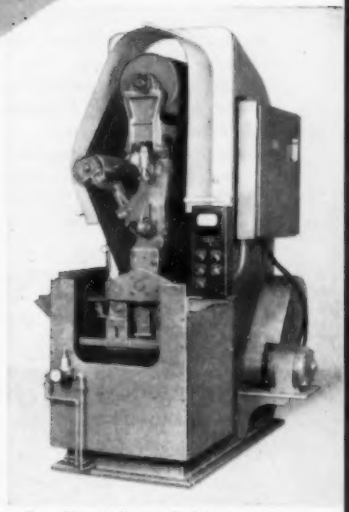
FLAT POLISH

Slash production costs EIGHT ways with MICRO-POLISH

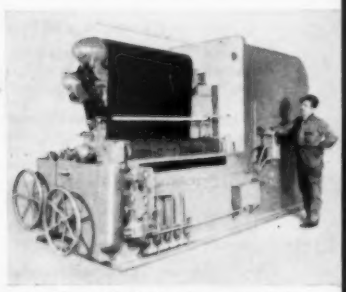
1. More square foot area can be pre-polished in a fraction of the time required for any type of contour polishing.
2. Cost per square foot is by far the lowest of all methods.
3. Use of lower steel grades rather than higher finishes give larger initial stock saving.
4. Improves press and die action.
5. Pre-polished steel (5-8 micro-inches) produces outstanding results with the most exacting, modern plating practices.
6. Pre-polished steel provides a uniform surface giving a plating deposition of maximum protection with minimum plating.
7. Prefinishing with subsequent forming produces lower unit cost.
8. Rejects due to base metal finishing are essentially eliminated.

"Complete" Package

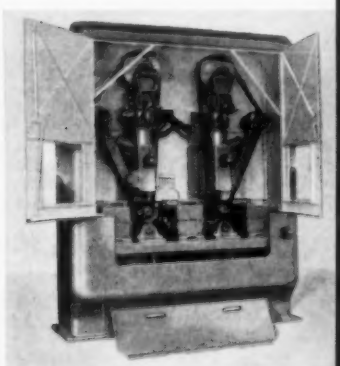
Murray-Way will engineer a complete automatic finishing line or a single machine to aid you in reducing your operating costs, improve finishes and increase production. For complete information—CALL OR WRITE



Small unit for polishing narrow strip or sheet stock.



A Micro-Polish giant used in reclamation grinding of steel strip.



Space saver unit for polishing flat bar stock. Two heads and two grades of belt grain accomplish the complete job without rehandling.

MURRAY WAY

MURRAY-WAY CORPORATION

P. O. BOX 180, MAPLE ROAD EAST · BIRMINGHAM, MICH.

Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.

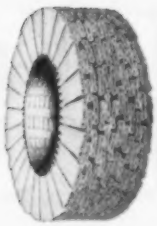
INDICATE A 937.

EQUIPMENT & SUPPLIES

E—929. "Centerless" Sisal Buff—To meet the need of metal finishing plants for an extra-flexible buff that reaches into crevices and odd-shaped contours, a new centerless unit sisal buff is now being manufactured by American Buff Co.

The flexible units, made of bias sisal wrapped in cloth, retain compound along leading edges and circumference to give a hard, fast cutting action that gets work done in fewer passes. This heavy-duty cutting makes the unit sisal buff ideal for use on brass, carbon steel, stainless steel, and aluminum.

Despite its fast cutting, the new buff is protected against heat discoloring by its patented, air-cooled "Centerless" construction. Units are securely held in place by steel "Lok-Tite" rings, rather than solid or perforated centers. The simplified design of these rings permits an almost unlimited number of sections to be locked together with complete safety, making possible a buffing face of 12 inches or more in width.



Extra-flexible

E—930. Short Circuit, Yet No Damage—A new overload protection device, the Sel-Rex "Gard-O-Matic," makes it literally impossible to damage the germanium cells in case of overload or short circuit, in a Sel-Rex Germanium rectifier, according to Bart-Messing Corp.

The "Gard-O-Matic" consists of two separate Sel-Rex designed auxiliary circuits which act instantaneously to shut off the unit when subjected to an ordinarily damaging overload or short circuit current, positively avoiding damage to the germanium cells. Two separate devices for double protection—double safety.

Bart-Messing engineers report that the "Gardo-O-Matic" overload device is being incorporated as standard equipment, at no additional cost, in all models of Sel-Rex germanium rectifiers.

E—931. New Laboratory Clamps—Many laboratory accidents can be prevented by using aluminum alloy clamps to hold glassware. Aluminum's high melting point provides far greater safety in the heating of inflammable or dangerous liquids. There is very little chance that an Alumaloy clamp will soften, dropping the glassware that contains the liquid. Aluminum provides a safety factor of 75 per cent. Its melting point of 1220° F compares with 700° F for cast zinc.

Tests also show a aluminum clamps have a tensile strength of 45,000 p.s.i. In addition, aluminum has a natural resistance to corrosion, giving clamps a longer, more useful life, he pointed out.

TYGON IS TOPS

For Lining Tanks

Here's why . . .

TYGON's outstanding resistance to acids and alkalies permits its use in all the usual lining and covering jobs.

TYGON's unique resistance to oxidizing acids, oils, greases, and solvents makes possible its use in jobs other linings cannot handle.

TYGON's flexibility permits close conformance, resulting in a good bond, to all but the most intricately shaped equipment.

TYGON's resilience minimizes the possibility of damage from mechanical abuse.

TYGON's elasticity permits thermal contraction and expansion without rupture.

TYGON's abrasion resistance withstands the wearing action of thick slurries and dry or moist chemicals.

TYGON's negligible extractibility prevents contamination of the most sensitive solutions.

TYGON's availability in white (compound TL-104), as well as standard black, permits its use where solution visibility is highly important.

TYGON's high electrical resistivity prevents current losses in electrolytic action.

TYGON's smooth, non-porous surface makes for easier cleaning and greater solution flow.

TYGON's thermoplasticity permits the "heat-sealing" of seams to form continuous, one-piece, impermeable linings.

TYGON's selective solvent sensitivity eliminates the "need" for curing to obtain a strong bond—makes possible installations of virtually any size—simplifies field repairs.

TYGON's non-oxidizing characteristics give it a long service life.

Write, right now, for more information! Ask for our new 12-page booklet on TYGON LININGS — Bulletin TL-526. It's packed with facts and figures.

U. S. STONEWARE

AKRON 9, OHIO

Process Equipment Division

Here's how . . .

Tank is sandblasted before lining.

Special cements are used.

Thick TYGON sheeting is applied.

Joints are "strip-sealed."

Entire lining is "spark-tested."

JID-1

IMPORTANT NOTICE TO MEMBERS AND SUBSCRIBERS

If you are going to move, it is necessary that the proper notification be made at the earliest possible moment, so that you may continue to receive your copies of PLATING without interruption.

Members must notify Branch Secretaries of changes promptly.

Notification should be made to this headquarters by letter, post card, or post-office form No. 22S, give the old address as well as the new, with postal-zone number if any. You should also notify your local post office on postal form No. 22 of your change of address. Both postal forms are obtainable at any post office.

You are urged to advise the PLATING Circulation Department and, in the case of Branch members, your secretary, as soon as you know your new address, preferably three weeks in advance of moving.

PLATING
Circulation Department
445 Broad Street
Newark 2, N. J.

MAIL BOX

Gentlemen:

We wish to bring up for discussion the matter of registration fees for the Annual AES Convention. As you are well aware, the policy that has been followed for many years has been to have a single registration fee which covered all social and educational activities. This system has worked well and has much in favor of it. The Society, however, has been growing and will continue to grow, and its size has now reached the point of outgrowing the single fee system. Also the registration fees have been steadily increasing and may have already reached a point of diminishing returns.

With this letter we are attempting to initiate a general discussion of the problem, and we hope it will induce the Society and its Executive Board to give serious consideration to the problem during the coming months. We also hope that this letter will be published and thereby induce the general membership to express itself in letters-to-the-editor or otherwise.

In support of a change, we have the following two comments to make about the present system:

1. The large fee discourages attendance at the educational sessions. This is particularly true in regard to the personnel of Universities and Government agencies—the very people who should be encouraged to attend. The educational session is the most important part of the Convention and it should not be subordinated to the social functions. This, in itself, should warrant some adjustment in the present system of fees.

2. The size of the banquet is such that it is difficult to find a suitable place to hold it. Washington had to use two rooms which, fortunately, could be opened up as one room, but Washington was almost reduced to setting up tables in the foyers. Even so the crowd was so large, that the din of conversation prevented many of the guests from hearing any of the after-dinner speeches.

The number of registrants requesting partial registrations at Washington and general comments indicated that attendance at the social functions was not strictly voluntary for many. The single fee system forces an overly large banquet attendance; and, at Washington, about 400 registrants paid for a banquet which they could not attend.

There are many other factors to be considered and they will certainly come out in any discussion. Our comments, however, indicate the need for a general airing of the situation.

In conclusion, we wish to point out that most of the technical organizations with which we are familiar charge only a nominal registration fee for the technical sessions and make a separate charge for each social function. For example, the American Chemical Society, Electrochemical Society, American Society for Testing Materials, and the American Institute of Mining and Metallurgical Engineers charge a registration fee ranging from three to seven dollars. The American Society for Metals does not charge any registration fee but pays for the cost of the convention out of the profits from the metals show and advertising.

Since the main objective of the AES is educational, we believe that this objective can be best attained at the conventions by divorcing the costs of the registration from those of the social functions and thus attracting a larger number of participants.

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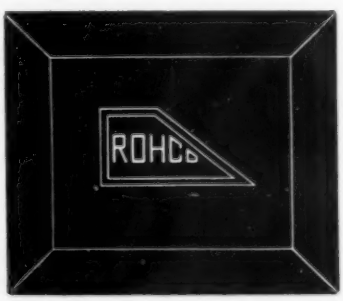


The Use of METAL SPRAYED COATINGS To PROTECT BULK SHIPMENTS

H. S. Hammond*

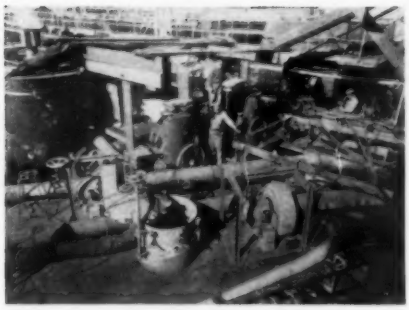


Photo shows the maze of sandblast equipment, ventilators, piping, hoses, air filters, etc. located on deck above the cargo spaces. In order to prepare the steel surface for zinc spraying it was necessary to sandblast with a clean, sharp abrasive to remove all rust and scale and to roughen the surface so that the zinc would have a good tight bond to the steel. Silica sand was found to be too soft for the job so that Joplin Grit was selected as the best and most economical abrasive that could be used at the location.

During the past ten years there has been a concentrated effort by a great many large chemical firms to find ways and means of shipping their products in bulk, in order to lower shipping costs, eliminate handling and packaging and to do away with expensive drums, barrels, cans, and containers.†

This caused a trend towards bulk shipments and companies built huge tanks in ships and barges for moving hydrochloric acid, caustic soda, formaldehyde, petroleum solvents, glycerine, and other products. In each instance, where bulk shipments are made by tanker, barge, tank car, or trailer, the manufacturer must solve the problem of a suitable lining to protect the product from contamination and often to protect the steel tank from corrosion.

Metallizing has played an important role in this new trend in shipments; and today, cargo spaces in tankers, sprayed metallic zinc and aluminum and other metals to protect the products from contamination and discoloration.

About eight years ago, one of the country's largest chemical firms began seeking a lining or coating that could be applied to the interior surfaces of cargo spaces in tankers, barges, and large storage tanks, that would be suitable for transporting and storing water-white petroleum solvents, glycerine, and similar products. The requirements were that the coating would have to withstand the solvents without deterioration and protect them against contamination and discoloration and at the same time protect the steel against corrosion when tanks were empty, or on the return trip, and when they were cleaned and degassed for inspection and repair work.

Since there was no organic coating or lining that could be applied in tankers that would fulfill these requirements, either sprayed zinc or aluminum applied by the metallizing process over a thoroughly sandblasted surface was recommended. Samples of these two metals were supplied and after thorough laboratory tests, it was found that either of these metals was satisfactory for protecting the products from contamination and the steel from corrosion. Since the zinc was easier to spray and would give greater cathodic protection to the steel, this metal was chosen.

The first job selected for the sprayed zinc was in 1949 in one of the tanks of a T2 tanker, where the principal products to be hauled were acetone, methyl ethyl ketone, isopropyl alcohol and glycerine, all of which were required to be water-white at destination.

In order to prepare the steel surface for zinc spraying, it was necessary to sandblast with a clean sharp abrasive to remove all rust and scale and to roughen the surface so that the zinc would have a good tight bond to the steel. Several grades of silica sand were available at the job site. However, these were found to be soft and lacked the sharpness required, so that Joplin Grit was selected as the best and most economical abrasive that could be used at the location.

After alterations were made in the tank, separate piping installed to pump the material, and the tank tested for leaks, the next procedure was to blast with the Joplin Grit and apply a zinc coating 0.008 inch thickness by means of the metallizing process. Before starting the work, a portion of one of the deck plates was removed in order to provide sufficient area for ventilating pipes and to remove the abrasive after blasting.

Ventilation equipment was set up and ducts were arranged as close to the blasters and sprayers as possible.

* MW Protective Coatings Division, Metalweld, Inc., Philadelphia, Pa.

† As far back as 1939, the DuPont Company arranged to get a number of petroleum products from the West Coast to the East Coast by tanker. A little later, Dow Chemical Company and Carbide Chemicals Corp. converted tankers for moving caustic soda, ethylene glycol, carbon tetrachloride, ethylene dichloride, propylene glycol and other products. Today, Celanese Corporation of America, the Esso Standard Oil Company, the Oronite Chemical Company and many others are shipping a large quantity of their products by tanker.

The shipyard furnished tubular scaffolding in the tank and other facilities such as compressed air for blasting and spraying, power for operating exhausters, and lighting current for dust-proof extension lights.

It was decided to blast and spray the bottom of the tank first. This necessitated a period of blasting, followed by a cleaning crew to remove and shift sand between the stiffeners and then a crew of metal sprayers to spray completely the area before there was any chance of oxide forming on the surface. This procedure was followed until the entire bottom was completed. In spraying, the side walls and top, the blasters were followed immediately by the metal sprayers with no attempt to clean out sand from the bottom between the two operations. Sand was removed periodically as the job progressed by a third shift.

After the zinc spraying was completed, the deck plate was welded in position and the welds were blasted and zinc coated. The areas in the way of scaffold supports were also blasted and touched up with zinc spray. The tank was then thoroughly cleaned of all sand and zinc dust and washed with fresh water.

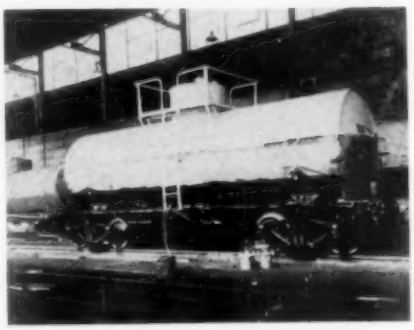
During the zinc spraying process, an accurate check was made after each shift to determine thoroughly the thickness of the zinc deposit. This was done by using a magnetic thickness gauge. The minimum thickness of zinc allowed was 0.008 inch.

During the progress of the work, each sandblaster, metal sprayer, and inspector was provided with a gas mask fed with compressed air through a special air filter. A positive pressure was maintained at all times on the gas mask so that there was no danger of breathing air that was contaminated with dust from the blasting and zinc spraying. The men were also supplied with rubber hoods that extended over the head and shoulders to keep dust away from the hair, ears, and skin. Ventilating fans were used constantly while work was in progress, and the dust was exhausted over the side of the ship.

After a year's service, the zinc coated tank was cleaned by a modified Butterworth system, using fresh water and holding the temperature to about 130° F, so that the zinc would not be damaged by high temperature steam or hot water. After a thorough inspection, it was found that the zinc was protecting over 99 per cent of the surface and the only indication of rust occurred in a few isolated spots that had been missed or poorly coated in inaccessible places. These areas were touched up by blasting and respraying with zinc.

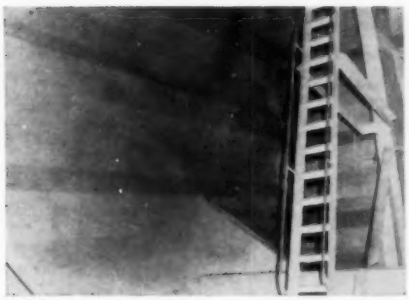
During the annual inspection in 1953, it was necessary to make some welding repairs in the tank and there was some question in the minds of the tanker owners whether these repairs could be made while the tanker was in port for a limited time. As soon as the tank was gas-freed and washed out with fresh water, a two-man crew, with a small blast machine and spraying equipment, was sent to the site and proceeded to blast and spray the areas that were welded and there was no difficulty in completing the work in the time scheduled. Also, a complete inspection was made of the tank and the zinc coating was found in nearly perfect condition.

T2 Tanker whose tanks were metallized with zinc to protect its bulk liquid chemical cargoes from contamination. Original work was done in 1949 and periodic inspections since that time indicate that the coating will last for 20 years



In addition to marine tankers, rail tank cars and trucks have received similar metallizing protection with equal success

Photo shows the manifolding of propane and oxygen cylinders for the metallizing guns. A total area of 60,000 sq ft was metallized with a coating of 0.008 inch



Outboard bulkhead on left and ladder shot from tank bottom showing completed metallized job

Zinc spraying cargo spaces inside tanker for protecting solvents in shipment against contamination. Coating thickness of 0.008 inch has been sufficient for the protection of the products carried (acetone, methyl ethyl ketone, isopropyl alcohol and glycerine) from contamination and assurance that they will be water white upon delivery

There was also some other welding and repair work done in the tank in 1953 in Houston, Texas, and a local firm was called in to repair the zinc coating after the repairs were made. A written report and colored slides taken in the tank at that time indicated that the zinc coating was in excellent condition, with no rusty areas that would contaminate the products or deteriorate the steel.

In 1954, another thorough inspection was made over the entire area using a magnetic thickness gauge and the lowest readings showed from 0.005 to 0.007 inch thickness which indicated that the original coating of a minimum 0.008 inch thickness would be good for over a 20-year period.

In 1950, the same chemical company decided to have four large tanks, 15 feet diameter x 46 feet 0 inches long, zinc sprayed in two barges that operate on the Mississippi River, hauling solvents to Chicago. The same general procedure and technique was used as in the tanker, and the work was completed in 1951.

In 1953, the tanker operators were convinced that the use of sprayed metallic zinc was the answer to their problems of shipping solvents free of contamination and discoloration. Therefore, when it was necessary to build a new tanker to handle the increased demand for the contamination-free products, specifications were written to metallize five tanks in the new ship. The work was to be performed during the construction of the vessel, and it was the desire of the shipbuilder and the owner that the delivery date not be delayed due to the metallizing. By close cooperation between the shipyard and the author's company, the entire five tanks, with an area of 61,000 square feet, were completed in five weeks. About 300 tons of abrasive was used for blasting and 29,000 pounds of zinc sprayed to maintain a minimum thickness of 0.008 inch. The average thickness was 0.010 inch.

An inspection of these tanks was made in the summer of 1954; and, except for a few areas that were missed during the spraying, the entire surface was rust free and no deterioration of the coating was noticed. The damaged areas were touched up and the ship put back in service.

Four other large barge-tanks were also zinc sprayed in 1953 for hauling solvents on the Mississippi River. In all, tankers and barge-tanks totaling nearly 100,000 square feet have been sprayed with zinc for this one chemical concern, for hauling solvents and glycerine, and there have been no reports of any discoloration or contamination to the products or corrosion of the zinc lined tanks.

During the summer of 1955, the zinc spraying of two large storage tanks, 60 feet diameter x 36 feet high, with an area of 24,000 square feet, in an Eastern Terminal located near New York was completed. The tanks are for the storage of glycerine, and one of the zinc sprayed tanks in the T2 tanker will be used to haul glycerine from Texas to the Eastern Terminal.

As far back as 1933, tank cars and trailer-tanks were lined with zinc for hauling glycerine and solvents, and with aluminum for hauling transparent lacquers. Since then, a great many tank cars have been lined for similar service; and, in recent years, tank cars and trailers have been sprayed with aluminum for hauling phthalic anhydride and with tin for ethylene diamine and with stainless steel for ethylene oxide.

Inquiries are increasing rapidly from manufacturers of various products for information regarding linings suitable for shipping their products in bulk. It is predicted that the volume of bulk shipments in the next few years will be even greater than the past and that metallizing will play an important part in solving their problems.

H. S. Hammond, since 1929 has been actively engaged in metallizing and was for several years associated with the Metallizing Co. of America, who brought the original "Schoop" Metal Spraying guns into this country from Germany. In 1932 became associated with Metalweld, Inc., Philadelphia and started the Protective Coatings Division which now includes coatings and linings of rubber, Koroseal, Neoprene and plastics as well as metallized coatings.

Graduate Mechanical Engineer from Pennsylvania State, member of the Sigma Chi Fraternity, American Welding Society, Metco Systems Contractors and present chairman of AWS Committee on Metallizing.

PLATING ON UNUSUAL METALS

By Charles L. Faust* and John G. Beach*

INTRODUCTION

Research and development of the past ten years have placed new demands on metals for strength and corrosion or oxidation resistance at temperatures above 500° F and even exceeding 2000° F. Metals and alloys are known with the right nuclear properties or high-temperature strength. Some of the metals of nuclear and structural interest are: aluminum, beryllium, molybdenum, niobium, thorium, titanium, uranium, and zirconium, alloys of these metals with others, and alloys of the type represented by Inconel and Stellite. Each has poor surface properties in one or more environments or applications for which it is otherwise ideal, or is difficult to join by soldering, brazing, or welding. Cladding with another metal, that will provide the needed surface behavior, is the answer. Cladding by electroplating (i.e., electrocladding) has advantages and disadvantages as shown in Table I. Ways have been found for surmounting the disadvantages.

The unusual metals to be clad are either very active chemically or are quite passive. Passive metals must be activated and the nature of the activated surface influences the structure and performance of the electrocladding. The activation designed to provide the best adherence and bond strength might make other properties inferior and vice versa. Hence, the general problems of processing appear similar to those for preparing and plating on aluminum or stainless steel. Specific procedures for aluminum and stainless steel have not been directly applicable, and new formulations were needed for pickling, activating, polishing, and plating baths.

TABLE I. ADVANTAGES DISADVANTAGES OF ELECTROCLADDING

Advantages	Disadvantages
Coating thinness not attainable by other methods.	Tendency to porosity typical of crystal structure.
Applied without heat or stress.	Plate structure influenced by surface state of basis metal.
Covers irregular shape.	
Finish-shaped parts can be clad.	Need to make electrical contact without a bare spot resulting.

Thin layers of electrodeposited metals cannot cover over defects resulting from machining, grinding, and fabrication. So, the method of shaping and surface preparation is important and sometimes critical.

* Battelle Memorial Institute, Columbus, Ohio.

The choice of metals for electrocladding is limited to those for which electrodeposition methods are known: aluminum, bismuth, cobalt, copper, gold, indium, iron, manganese, nickel, palladium, platinum, rhodium, tin, zinc, and certain alloy plates. Fortunately, a number of these metals can be useful electrocladdings either when used alone or in combinations of two or more.

Of course, the metal cladding must itself possess stability. Furthermore, high-temperature use imposes requirements on a plate not faced in the customary commercial uses: history of the metal receiving the plate; the nature of alloys formed by high-temperature diffusion at the interface; rates of diffusion; and permeability to gases.

Properly devised and engineered electrocladdings can greatly extend the operating ranges for engineering materials. Some of the factors important in electrocladding are illustrated by the following discussion.

REACTOR MATERIALS

The need for neutron economy further limits the choice of metals for electrocladding. For coatings over 0.010 inch aluminum, bismuth, lead, and tin can be used. Chromium, copper, iron, manganese, nickel, palladium, platinum, and zinc can be used in thickness less than 0.010 inch. For reasons of cost, versatility of electroplating, and properties, nickel is a good choice. Chromium, copper, iron, and zinc also merit attention.

The neutron capture ability of nickel limits its thickness as a coating to about 0.005 inch. Often the thickness can be only 0.001 inch. Thus, for severe conditions imposed on the clad materials, exceptionally high quality is demanded of the plate and of finish on the basis metal surface.

Iron shows less neutron capture, costs less, and is more available than nickel. So, iron is considered whenever its lower oxidation resistance is not a handicap.

Aluminum is stable under radiation, shows low neutron capture, and has acceptable resistance to corrosion. It can be used for coatings up to 0.030 inch thick, but the electroplater is limited to using nonaqueous organic baths or a fused salt bath.

METALS FOR HIGH TEMPERATURE AND OTHER USES

Zirconium is difficult to join, but well-bonded electroplates on it can be soldered.[1] Niobium,[2] high-nickel alloys, and cobalt alloys, when electroclad, are easier to join by brazing.

Titanium offers practical advantages where high strength and low weight or good corrosion resistance is needed. Full advantage of these properties is often pre-

vented by poor resistance to galling and wear, and to oxidation at elevated temperatures. Titanium also needs protection against taking up of hydrogen and nitrogen, as during heating and hot forging. Only within the past year have reports come of successful electrocladding of titanium. The released information is rather meager at this time, and methods for plating have not been disclosed.

The excellent mechanical properties of molybdenum at temperatures of 2000° F or higher are offset by poor oxidation resistance. Molybdenum trioxide forms in air at temperatures as low as 800° F and is lost by volatilization. Such oxidation soon results in disintegration unless a stable protective coating is applied. For 2000° F service, electroplates are limited to those metals with melting points over 2000° F and which do not form low-melting alloys as a result of diffusion at operating temperature. Thus, plating might be limited to chromium, cobalt, gold, nickel, and certain metals in the palladium and platinum groups. Special techniques are needed for preparing and electroplating on molybdenum.[3,4]

Other metals receiving attention for electrocladding are Niobium, Stellite, and Inconel.

PREPARATION AND PLATING

The best possible starting surface is needed for electrocladding. Plated coatings cannot overcome surface defects that are caused by machining, grinding, and fabrication. Such surface damage or defects may not be visible, yet they degrade the quality of an electroplate over them. Beryllium, for example, must be machined with much greater than usual care. Until this situation was made clear to machinists, beryllium was not successfully clad with protective electroplates.

Figure 1 shows cracks formed in beryllium simply as a result of flexing during centerless grinding to remove the barklike extrusion surface. The cracks were not visible to the unaided eye but were revealed after removing 0.00025 inch of surface by chemical polishing. Removing more than 0.00025 inch of surface often was necessary for providing a sound surface for plating. The weakness of mechanical surfaces has been demonstrated quantitatively in an earlier publication.[5]

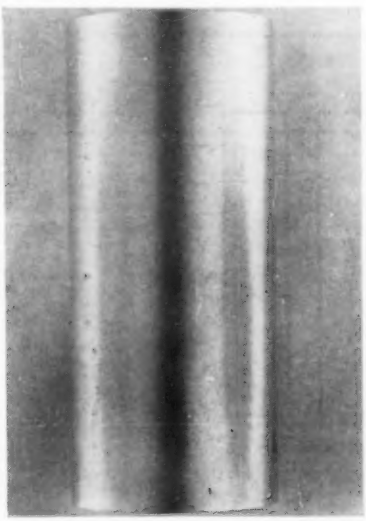


Figure 1. Circumferential cracking caused by centerless-grinding beryllium and still visible after removing 0.00025 inch surface by chemical polishing.

The necessity for careful grinding of hardened steel is well known. Conditions for grinding or machining also must be carefully worked out for uranium and thorium which tend to burn and for titanium and zirconium which gall and flow.

Polishing and burnishing or buffing can provide a smooth surface, but the flowed metal can cover over surface defects which will be a source of ultimate weakness during service of an electroplated part. Chemical and electropolishing removes surface metal uniformly and provides a sound unstressed basis for electroplate. However, surface dirt embedded by prior operations and/or inclusions are also removed, leaving holes. Subsurface defects from fabrication may be opened, and such defects, if large enough, will not be covered by the plate. Protective quality is thus lowered. The best practice is to nurse the metals along from their beginning so as to avoid inclusions, seams, imperfections, etc., then fabricate with suitable care and understanding; and, by proper choice of activation and plating procedures, a sound product of good quality can be made.

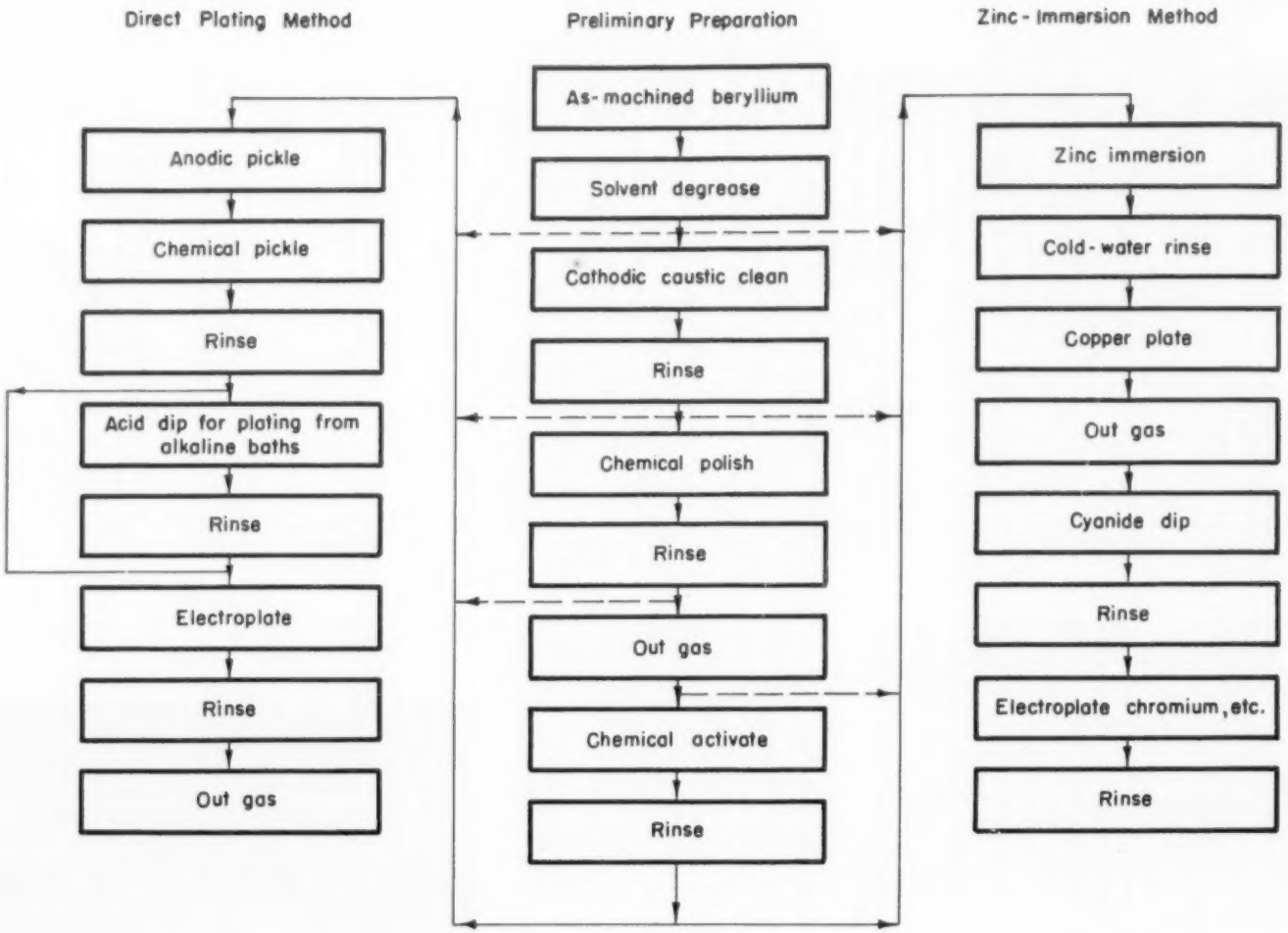
The literature has many recipes for preparing active or passive metals and for plating on them. The choice of methods will be guided by the following discussion. For example, various baths for plating aluminum, bismuth, copper, iron, nickel, and zinc are given in Tables II, III IV, V, VI, and VII, respectively.

TABLE II. ALUMINUM PLATING BATHS

Component and Conditions	Organic	Fused Salt
$AlCl_3$	400 g/l	80 per cent
NaCl		20 per cent
LiH	6 g/l	
Ethyl ether	balance	
Temp, F	RT	350
CD, amp/ft^2	10	18
Min/0.001	120	75

TABLE III. BISMUTH-PLATING BATH

$BiCl_3$	100 g/l
NaCl	18.5
HCl (1.18 sp gr)	210 ml/l
Temp, F	70 to 90
CD, asf	30
PR	10.5 seconds direct 5.0 seconds reverse
Time, min	33 per 0.001 inch



Note: Solid lines, preferred procedure
Dotted lines, alternate procedure

FIGURE 2. FLOW SHEET OF OPERATIONS USED TO PLATE ON BERYLLIUM

N-28480
C-1478

TABLE IV. COPPER-PLATING BATHS

Component, g/l, and Conditions	Bath Number I	Bath Number II
NaCN	30.0	46
CuCN	22.5	26
Na_2CO_3	15	
$Na_2S_2O_3$	0.5	
K_2CO_3		15
KOH		7.5
NaF		22.5
pH	9 adj. with tartaric acid	13.2 ± 0.1
Temp, F	120	130
CD asf	25	30 first minute 15 thereafter

TABLE V. IRON-PLATING BATHS

Component, g/l, and Conditions	Bath Number I	Bath Number II	Bath Number III	Bath Number IV
$FeSO_4 \cdot 7H_2O$			300	
$FeCl_2 \cdot 4H_2O$		300	42	
$(NH_4)_2SO_4$			15	
$CaCl_2$		335		
Na formate			15	
Boric acid			35	
$Fe(NH_4)SO_4$	350			350
Wetting agent	1		1	
pH	4 to 5.5	0.8 to 1.5	4.0	2
Temp, F	140	190+	140	190+
CD	60	60	40	70

TABLE VI. NICKEL-PLATING BATHS

Components, g/l, and Conditions	Bath Number I	II	III	IV	V
$NiSO_4 \cdot 7H_2O$	100	145	300	300	240
$NiCl_2 \cdot 6H_2O$			50	50	45
NH_4Cl	30	15			
Na_2SO_4	100				
$MgSO_4$		75			
Na formate			15		
Wetting agent*	1	1		1	
H_2O_2		As needed			
Boric acid	15	15	30	30	30
pH	5 to 6	5 to 6	4	4	2
Temp, F	100	100	140	140	140
CD	15	15	40	40	40
Time, min/0.001 inch	80	80	30	30	30

* Sodium lauryl sulfate (purified).

TABLE VII. ZINC-PLATING BATHS

Component, g/l and Conditions	Bath Type Immersion	Bath Type Electro
$Na_4P_2O_7$	120	
$ZnSO_4 \cdot 7H_2O$	40	240
NaF	7.5	
K_2CO_3	5	
NH_4Cl		15
$Al_2(SO_4)_3 \cdot H_2O$		30
$MgSO_4 \cdot 7H_2O$		70
Licorice		1
pH	7.5 to 8	4.0
Temp, F	180	80 ± 5
CD, asf	0	25
Time, min	5	15 per 0.001 in

Usually, one hopes to achieve the desired cladding benefit by using a single plate. Often the best protection is provided by a two- or more layer plate. The reason can be related to: the need for the best adherence and bond strength; the nature of the alloys formed by diffusion at the temperature the product is to be used; the galvanic relationship of plate to basis metal; and the high-temperature stability that is needed.

ACTIVATION AND PLATING BERYLLIUM

Activation

Beryllium, chemically and electrochemically, presents problems comparable with those for aluminum, zinc, and magnesium.[6] The general procedures that can be used are shown in Figure 2. Specific conditions are as follows:

Cleaning is satisfactory by vapor or solvent degreasing, and as cathode at 25 to 75 am/sq ft in a bath at 70 to 90° F and containing 50 to 100 g/l of NaOH or KOH.

Chemical polishing, for removing the as-machined surface for inspection to reveal cracks and damage, takes off 0.001 inch in 20 minutes at 120° F in a bath containing 5 per cent H_2SO_4—75 per cent H_3PO_4—7 per cent CrO_3.

Chemical activation is necessary to remove the passive film left by chemical polishing. Dipping for ¼ to ½ minute in 5 per cent sulfuric acid (by weight of 1.84 sp gr) at 80 ± 10° F removes the passive effect.

After the preliminary treatments for surface inspection, a choice in sequence of operations is available as shown by dotted lines in Figure 2. The selection of the sequence is based on the preparation needed for the particular electroplate. Simultaneous activation and immersion zinc plating is satisfactory directly after chemical activation. Then, conventional methods can be used for plating other metals over the immersion zinc.

If an electroplate of copper, iron, nickel, silver, or tin is desired directly on the beryllium, further treatment by anodic and chemical pickling is required.

Anodic pickle for 2 minutes at 100 ± 50 amp/ft² in 10 per cent phosphoric acid (by vol of 1.69 sp gr)—2 per cent hydrochloric acid (by vol of 1.18 sp gr) at 80 ± 10° F.

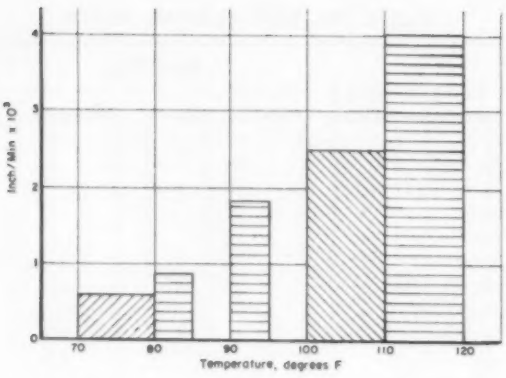


Figure 3. Rate of dissolution of Zirconium in chemical polishing bath

Chemical pickle for 2 minutes in concentrated nitric acid (1.42 sp gr).

The chart of general sequences shows that only rinsing is then necessary before plating in acidic baths and in the pH 9 copper bath. However, an additional acid step is required before silver or tin plating in highly alkaline baths:

Acid dip prior to highly alkaline plating baths for ½ to 1 minute in a solution containing 100 g/l NH_4SO_4 at pH of 2 and at temperature of 80 ± 10° F.

Plating

Aluminum is plated on beryllium after anodic and chemical pickling, rinsing, and drying with alcohol. Prior to plating in the aluminum chloride-lithium hydride bath, Table II, the beryllium is dried in alcohol and ether before immersion in the plating bath.

Chromium plating is done in the 400 g/l CrO_3—4 g/l H_2SO_4 bath at 130° F and 220 amp/sq ft or at 113° F and 110 amp/sq ft after zinc immersion coating and copper plating the beryllium.

Copper can be plated directly on beryllium from the mildly alkaline pyrophosphate bath† or from Bath I in Table IV. Bath II can be used after immersion zinc. The acid copper-sulfate bath requires a strike copper plate first.

Iron, Baths I, II, and IV in Table V are reported in the literature and were not satisfactory. They attacked the beryllium or produced pitted deposits. Good iron plate was deposited from a modified bath, III, directly on beryllium or over immersion zinc coatings.

Nickel is plated first from Bath II of Table VI, either directly on beryllium or over an immersion zinc coating. About 0.0003 to 0.0004 inch of the strike nickel is required. After it, nickel thickness is built up in Bath III.

Silver can be plated directly at 7.5 amp/sq ft for 5 minutes on beryllium in a strike bath containing 4.5 g/l AgCN and 70.0 g/l NaCN at 80 ± 10° F, followed by plating at 25 amp/sq ft at pH of 13.0 in the following bath: 75 g/l AgCN, 112 g/l KCN, 22.5 g/l K_2CO_3; at 120° F.

Tin can be plated directly on beryllium at 25 amp/sq ft in the following bath: 150 g/l $Na_2SnO_3{\cdot}3H_2O$, 15 g/l NaOH, 22.5 g/l $Na_2C_2H_2O_2$ at 150° F.

Zinc can be plated directly on beryllium or over immersion zinc by using the acid bath shown in Table VII.

ACTIVATION AND PLATING ZIRCONIUM[1]

Activation

If the zirconium has been processed at high enough temperature, it has a chemically resistant skin that must be removed by such mechanical means as sand blasting, vapor blasting, or surface grinding.

Chemical polishing improves the surface and is done in the following solution: 100 g/l $NH_4F{\cdot}HF$, 400 ml/l concentrated nitric acid, 200 ml/l H_2SiF_6.[7] The metal removal depends on the temperature, as shown in Figure 3.

Etching of the zirconium surface is necessary for providing good as-plated adhesion and the best diffusion bonding. Etching is done in a $NH_4F{\cdot}HF$ solution in which the molar ratio of NH_4F/HF is in the range of 1-2 to 4-1. Removal of about 0.0006 inch of surface is recommended for maximum bonding and requires about 3/4 to 3 minutes immersion at 100° F, depending on the mole ratio NH_4F/HF. The as-plated adhesion values are shown in Table VIII. The adhesion was stronger than the soft-solder joint used in the test.

Plating

Maximum bonding of electroplate on zirconium requires diffusion heat treating. Nickel forms strong bonds but must be deposited in baths free from wetting agents and organic additives. Thus, Bath III of Table VI is used. After nickel plating and diffusion bonding, other metals can be plated on the nickel, as would be done by conventional methods. Heat treating for diffusion bonding is discussed in reference[1] and summarized in a later section in this paper.

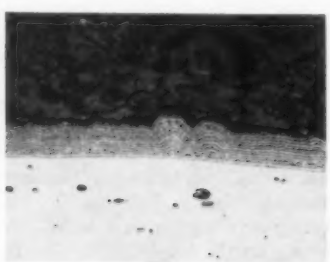


Figure 4. Twenty-four alternate layers of bismuth and nickel electroplates on aluminum. 250X magnification

† Unichrome Copper, product of United Chromium Div. of Metal and Thermit Corp.

Immersion zinc plate can be applied by dipping zirconium for one minute in molten zinc chloride, 440 to 450° C (226 to 232° F).[8] A ¼-inch-round brass rod was soft-soldered at one end to the face of flat, immersion zinc-coated zirconium specimens. Application of more than 600 psi force (the strength of soft solder) 6 inches from the joint was required to break it. When the brass rod was silver soldered to zinc-coated zirconium, the joint did not fail until after the rod was severely bent. These well-bonded coatings were achieved on zirconium fabricated from arc-melted, crystal-bar stock (iodide process). The results were not so good with zirconium produced by magnesium reduction.

ACTIVATING AND PLATING NIOBIUM[2]

Introduction

Electroplated coatings on niobium aid subsequent electrocladding with wrought metals. Niobium, like zirconium, avidly forms hydrides in aqueous activating solutions. Electrocladdings must, therefore, be chosen for easy permeability to atomic hydrogen formed when the niobium hydride decomposes. Nickel and iron electroplates are generally permeable to atomic hydrogen and can assist in the further cladding with other metals.

Activation

Niobium was activated as follows: Electrolytically etch with alternating current at 1 volt (200 asf) to 5 volts (1000 asf) for 1 to 3 minutes in concentrated hydrofluoric acid (49 per cent HF) at 75 ± 5° F. After rinsing, the slight black smut formed during etching was removed by dipping for a few seconds in an acid solution of 50 volume per cent nitric acid (70 per cent HNO_3) plus 2 volume per cent hydrofluoric acid (49 per cent HF). The niobium was then rinsed and electroplated.

Plating

Nickel was plated in Bath IV (Table VI) at a pH of 2. Iron was plated from Bath III (Table V) at 30 asf. The nickel and iron plates were 0.005 inch thick. Both as-plated coatings could be peeled but with some difficulty by bending and digging with a knife blade.

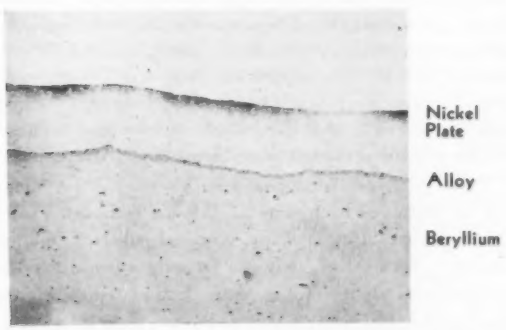


Figure 5. Nickel-plated beryllium after 18 hours at 752 F. 200× magnification.

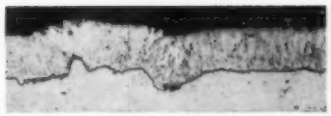


Figure 6. Iron-plated Beryllium after 18 hours at 752 F. 200× magnification.

TABLE VIII. AS-PLATED ADHESION OF NICKEL ON ZIRCONIUM VS MOLE RATIO OF NH_4F/HF[1]

Mole Ratio	Adhesion, psi
0	<1000
1	<1000
1.2	>6000
3.0	>6000
16.6	<1000
18.8	<1000

ACTIVATING AND PLATING MOLYBDENUM[9]

Activation

Molybdenum was prepared for plating by chemical etching for 1 minute in the following solution at 70 to 90° F.

100 g/l KOH
300 g/l $K_3Fe(CN)_6$

followed by rinsing, dipping in 15 per cent hydrochloric acid (by vol of 1.18 sp gr), and rinsing.

Plating

Chromium plate appears to adhere better than nickel or iron directly on molybdenum. Chromium was deposited by first reverse current etching for 2 minutes at 280 asf in the following plating bath at 100° F:

400 g/l CrO_3
4 g/l H_2SO_4

and then plating at 500 asf.

Nickel was plated directly on the molybdenum or on the chromium-plated molybdenum, first in the Woods strike bath[10] for 15 minutes at 50 asf and then in Bath V, Table VI.

Iron was plated on molybdenum in Bath IV, TableV. A 50 per cent hydrochloric acid solution (by vol of 1.18 sp gr) was used instead of the 15 per cent acid dip after the ferricyanide etch. After rinsing, the iron plate was dipped in the 50 per cent hydrochloric acid and nickel plated in Bath IV, Table VI.

PREPARATION AND PLATING NICKEL ON BISMUTH

Introduction

Plating of nickel on bismuth was of interest in filling a need for a nickel-bismuth alloy coating on aluminum. The answer came by heating a coating of alternate layers of

Figure 7. Iron-plated niobium baked 22 hours at 400 F in vacuum and heated 1 hour in vacuum at 1300 F. 500× magnification

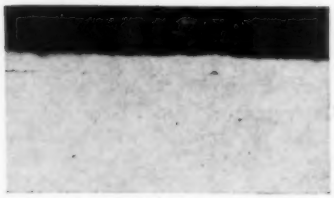


Figure 8. Nickel-plated niobium baked 2 hours at 400 F in vacuum and heated 1 hour in vacuum at 1300 F. 500× magnification

nickel and bismuth electroplates to form an alloy by diffusion on aluminum. In this case, bismuth was the unusual metal to plate on. Since heating at temperatures up to 752° F (400° C) was required, the nickel plate must be well bonded to the aluminum.

Preparation

The aluminum was prepared by anodic pickling at 50 asf for 2 to 5 minutes in 10 per cent (by volume of 38 per cent) hydrochloric acid at 80 ± 10° F, rinsed, chemically pickled by dipping 2 to 5 minutes in 10 per cent (by volume of 96 per cent) sulfuric acid at 80 ± 10° F, rinsed, and nickel plated in Bath II, Table VI.

The nickel plate was activated by electropolishing,[11] rinsing, cathodic pickling at 10 asf for 30 seconds in 10 per cent (by volume of 38 per cent) hydrochloric acid at 70 to 80° F, and bismuth plating.

Bismuth was electrodeposited at 30 asf using PR of 10.5-second cathode and 5-second reverse in the following bath at 80 ± 10° F.

100 g/l $BiCl_3$
18.5 g/l NaCl
210 ml/l hydrochloric acid (38 per cent)

Plating rate was 33 minutes per mil of bismuth.

Nickel was plated from Bath II, Table VI, on the bismuth which was rinsed following electrodeposition, dipped in 10 per cent (by volume of 38 per cent) hydrochloric acid, and rinsed. The acid dip removed a hydrolysis film from the bismuth. By repeating the cycle, bismuth was again plated on the nickel, and so on to produce 24 layers, as shown in Figure 4.

Bismuth plating with direct current resulted in plate with a dendritic coarse-grained structure. Grain refining was produced by glue and/or sulfonated cresol additions, but the bismuth plate was brittle and shattered during heating for diffusion alloying. The PR current avoided such deficiencies.

PREPARATION AND PLATING INCONEL[12]

Degrease as cathode in electrolytic cleaner, rinse and acid activate by anodic treatment for 3/4 to 4 minutes at 200 asf, followed by cathodic treatment for 15 seconds at 50 asf in 7N sulfuric acid at 70 to 80° F. Enter and leave the acid treatment with current on. Cold rinse and Woods nickel strike plate[11] at 50 asf for 2 minutes followed by cold-water rinse and nickel plate in Bath III, Table VI.

ALLOYING BY DIFFUSION AT THE INTERFACE OF CLADDING-BASIS METAL

The formation of an alloy interface by diffusion between cladding and basis metal can be both a blessing or a handicap.

Beryllium. The bond of as-electroclad nickel and iron on beryllium is strong up to 600° F. Diffusion occurs at temperatures above 700° F, and the alloy layer is weak and brittle. The result with nickel plate is shown by Figure 5.[13] Alloying has taken place at the interface at 792° F. Yet, iron plate, as shown by Figure 6, did not diffusion alloy in 18 hours at 792° F.[13] Both nickel and iron formed destructive diffusion alloys at 1112° F.

In the absence of protective claddings, beryllium reacts with water at 600° F (1550 psi), thus a protective coating must be impervious and resistant to water. Beryllium is attacked by sodium (not oxygen-free) at 930° F. After 600 hours in water at 600° F, no alloy layer of nickel-beryllium was apparent. After over 700 hours in sodium at 930° F, only a slight iron-beryllium alloy layer was apparent. Thus, these time-temperature effects determine limitations of nickel- and iron-plated beryllium regardless of whether corrosion protection or other properties are satisfactory.

Satisfactory adhesion of chromium plates on beryllium required the correct thickness of zinc and copper strike plates first, because of diffusion-alloy effects. The immersion zinc coating, followed by 0.0002 inch of copper plate, followed by chromium (0.0002 inch), gave protection to beryllium for 30 days in sodium at 930° F. When the copper plate was 0.0004 inch thick, the chromium plate spalled off during corrosion testing. When the zinc plate was increased by electrodeposition to 0.0005 inch, the composite zinc-copper-chromium plate blistered in one hour at 930° F. Zinc-copper-beryllium readily diffuses at 930° F. Too much zinc and copper presumably formed too much brittle diffusion alloy. Chromium did not diffuse into the zinc-copper-beryllium alloy interface.

These good as-plated bonds on electroclad beryllium can be destroyed by hydrogen. Atomic hydrogen enters the beryllium during pickling, chemical polishing, and/or plating. Removal of hydrogen by outgassing depended on the permeability of the plate. Iron-plated beryllium was outgassed by heating at 930° F prior to nickel plating. Outgassing also appeared complete after standing three weeks at room temperature. If outgassing was omitted,

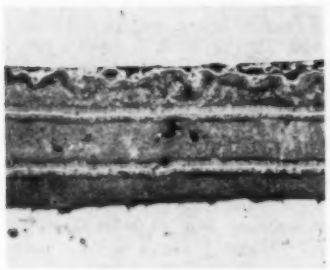


Figure 9. Bismuth-nickel electroplate layers alloyed by heating 70 hours at 194 F (90 C). 250× magnification.

the composite iron-nickel electroplate blistered at the iron-beryllium interface. Immersion for 30 minutes in boiling water outgassed chemically polished beryllium and zinc-immersion-coated copper-plated beryllium. Otherwise, the copper plate blistered within 24 hours.

Zirconium. The best bonding of electroplates on zirconium required heat treatment to cause diffusion alloying at the interface with the plate. The strength of the bond was related to the time and temperature of heating, as shown in Table IX.

TABLE IX. DIFFUSION ALLOY BOND STRENGTH OF NICKEL PLATE ON ZIRCONIUM

Time, hours	Temperature, F	Bond Strength (modulus of rupture) psi
4	1100	No bond
4	1200	50,000
0.75	1300	50,000
<0.1	1500	50,000
4	1300	35,000
0.75	1500	35,000
4	1500	5,000

Nickel plates on zirconium blistered unless the samples were baked before diffusion heat treatment. The aqueous etching and plating baths produced a zirconium hydride surface. Enough such hydride was formed by cathodic treatment in dilute sulfuric acid for X-rays to show $Zr{\cdot}H_2$ over layers of ZrH and Zr_4H. These hydrides are slowly decomposed at plating temperatures. At 1100° F and higher, effusion of hydrogen is too rapid.

Specimens diffusion bonded within one or two days after plating and without baking generally blistered. Specimens held three weeks or more at room temperature and then diffusion bonded showed much less blistering. Outgassing for two to four hours at 400° F eliminated blistering, but a one-hour bake was not enough.

Nickel plates 0.001 to 0.002 inch thick are usually required. Nickel thicker than 0.002 inch tended to blister from the zirconium when diffusion bonded, apparently because of the difference in thermal expansion. Nickel 0.0005 inch thick was satisfactorily diffusion bonded and subsequently could be plated with the rest of the nickel or with a different metal. This first nickel (or iron) plate particularly was necessary if the other metal was to be copper or silver.

Simple diffusion bonding of copper or silver plate to zirconium was prevented because the hydrogen could not get through them after decomposition of the zirconium hydride. Yet, copper plate on zirconium appeared well bonded when it was compressed during hot rolling. Silver and zirconium showed no alloying until about 1850° F, at which temperature a low-melting eutectic alloy formed.

After the low-temperature outgassing bake, iron plate could be diffusion bonded to zirconium in 5 to 15 minutes at 1500° F.

Niobium. Nickel- and iron-plated niobium required baking before heat treating. Iron-plated samples baked for 2 hours at 400° F blistered slightly at the edges, but those baked 22 hours at 400° F did not blister during heat treatment for 1 hour at 1300° F. Iron-plated niobium is shown in Figure 7.

Nickel-plated niobium blistered slightly after heating 1 hour at 1300° F even though baked first for 22 hours at 400° F. Figure 8 shows a slight tendency for alloying at the nickel-plate-niobium interface. Alloying is not visible for the iron plate shown in Figure 7. Both iron and nickel plates were bonded well enough to resist separation by bending and then prying with a knife blade. However, the blistering of the nickel plate indicates the presence of a relatively weak nickel-rich alloy layer. The iron plate is the better choice and can be used intermediate to other coatings.

Molybdenum. At temperatures of 1800° F and over, nickel, iron, and chromium plates form diffusion alloys with molybdenum. Alloy formation with nickel and iron is faster than with chromium. Oxide scale formed on chromium is loose and flaky, whereas on nickel the scale is dense and tight. Because of the diffusion alloying and scale effects, protection appears better if chromium plate is next to the molybdenum and is overlaid with nickel plate.

At such high temperatures, molybdenum can diffuse outward through the protective plate and react with oxygen in air at the surface to form MoO_3. Without blisters, pinholes, or defects being visible in the plate, as much as 8 per cent weight loss can occur by volatilization of MoO_3. In both liquid (melts at 1600° F) and gaseous form, MoO_3 attacks chromium and nickel. A diffusion-barrier plate between the molybdenum and the chromium plus nickel plate is desirable to eliminate or minimize alloy formation and loss of molybdenum.

Bismuth plate alloyed with nickel plate by heating for 70 hours at 194° F (90° C) as shown in Figure 9. Initial heating at temperatures above 392° F (200° C) resulted in blistering of the bismuth-nickel coating. There was some tendency for the diffusion alloy to separate at the demarcation of the layers, probably because of difference in thermal expansion or phase change.

Adherence Test

Electroplates on these unusual metals require more than adherence in the sense of one metal attached to another. The strength of the interfacial alloy is important. Thus, adherence becomes, more broadly, structural strength in the bond zone or bond strength.

A relatively simple test of bond strength was devised for electroplates on zirconium to aid joining by soldering or brazing.[1] In the test, a rod was joined by soldering or brazing to the plated zirconium. By applying a load to the rod at a chosen distance from the joint, a tensile-shear stress was applied to the plate interface. For comparison purposes, a modulus of rupture can be calculated as psi of bond strength. Bond strengths are shown in Tables VIII and IX.

By a procedure somewhat similar to that for plating on zirconium, bonds of 50,000 psi were obtained for nickel plate on titanium.

CONCLUSIONS

By understanding the chemical activity (or passivity) of a metal or alloy, it can be electroclad with any electroplate for which a deposition process is known. When the effect of mechanical surface damage is recognized and eliminated, well-bonded plate can be applied for good engineering performance at normal temperatures.

Sound products for engineering use can be provided by electrocladding when the tendency for the plate and basis metal to alloy by diffusion is recognized and when the strength and properties of the diffusion alloy are known to be satisfactory for the intended service.

When as-plated bonds of electroplate are not strong enough, adequate strength can be attained by proper heat treatment, taking into account the strength of any diffusion-formed alloy between the plate and the basis metal. As a corollary, when a plate and basis metal have suitable properties, but their diffusion-formed alloys do not, then a barrier plate with suitable diffusion characteristics can be used.

Thermal stability of the plate is important for sound electrocladding where service at elevated temperatures is required.

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John G. Beach is a graduate of Missouri School of Mines in Chemical Engineering and is a registered engineer in the State of Ohio. He has authored or coauthored over 8 papers and holds 7 patents.

He is a principal electrochemical engineer with 15 years' experience in metal coating fields; 3 years in raw material and production control for paints and varnishes and 13 years' experience in electrochemical engineering researches. For the past 7 years, he has conducted studies on electrocladding and electrodeposition on the unusual metals to provide resistance to corrosion and wear of nuclear materials and high temperature materials.

Beach is very active in Columbus Branch AES affairs. He was Branch President in 1949; Secretary-Treasurer for two years; on Board of Managers for two years; and a member of the Committee for the Tri-State Meeting in Columbus in 1955.

Dr. Charles L. Faust has written or coauthored over 60 technical articles, chapters in three books, and holds over 30 patents. His academic career includes studying at St. Louis University, a BS and MS in chemical engineering from Washington University, and a PhD from the University of Minnesota, also in chemical engineering. He is a registered engineer in the State of Ohio. He has conducted and supervised electroprocess research for 25 years.

He has been associated with Battelle since 1934, engaged primarily in electrochemical research. He is presently the head of the Institute's Electrochemical Engineering Division.

Dr. Faust has become associated with numerous technical and professional societies. In the Electrochemical Society, he has held several high offices including the national presidency in 1950. Dr. Faust was associate editor from 1944 to 1949, of Monthly Review and PLATING. Dr. Faust is also a member of the ACS, the Institute of Metal Finishing of London, Sigma Xi, Tau Beta Pi, Phi Lambda Upsilon, and Alpha Chi Sigma.

HIGH-TEMPERATURE ADHERENCE OF NICKEL PLATES TO MOLYBDENUM

S. S. Brenner*

ABSTRACT

A new method of obtaining high temperature adherent nickel electroplates on molybdenum is described. It consists of producing a thin, noncontinuous copper flash coating on the molybdenum surface prior to the nickel plating. The significance of the noncontinuous flash coating is discussed.

INTRODUCTION

With the advent of engines operating at temperatures as high as 1100° C, attention has been focused on molybdenum. Its high melting point, high strength and relative abundance makes it an attractive metal for high temperature use. Unfortunately, molybdenum has very poor oxidation resistance above 600° C, making it necessary to protect the surface with an oxidation resistant, adherent, and nonporous coating.

One of the simplest coating methods is electrodeposition. However, the as-plated adherence of most metals to molybdenum is generally poor, and, upon heating, the electrodeposit tends to buckle and blister. One method to circumvent this problem has been described by Korbelak.[1] By a plating procedure which included a chromium strike followed by a nickel strike from a Wood-nickel-chloride bath, he was able to obtain adherent electroplates on molybdenum.

The purpose of this report is to describe an alternate method of obtaining adherent electrodeposits, particularly nickel on molybdenum.

RESULTS

It has been found that adherent nickel plates on molybdenum can be produced by the following procedure:

1. Degrease (conventional method).
2. Etch (conventional method).
3. Brass strike -10^{-5} to 5×10^{-5} cm thick.
4. Anneal at 750° to 900° C for 10 minutes in nonoxidizing atmosphere.
5. Nickel plate to desired thickness.

Fig. 1. Effect of brass strike and heat treatment on high temperature adherence of nickel to molybdenum. (a) Normal plating; (b) brass strike technique

The brass strike was obtained by electrodeposition from a brass cyanide solution† operated at 40° C. A current density of about 0.2 A/cm² for 10 to 60 seconds was employed. Although the efficiency of the bath was very low, a smooth and uniform brass layer was formed. A total of 52 test specimens were nickel coated by the above method. The specimens generally 4 x 7.5 x 0.150 cm in dimension, with platings of up to 0.030 cm thick, were tested for adhesion by heating at 900° C for about 30 minutes. Only three specimens showed some slight indication of blistering. Figure 1 shows the effect of the brass strike on the adhesion of the nickel.

The heat treatment of the brass strike had the effect of producing metal islands on the surface of the molybdenum. This can be seen in Figures 2 and 3, which show the brass strike 1.5×10^{-5} cm in thickness before and after heat treatment at 850° C. That Figure 3 indicates islands rather than depressions, was ascertained by examining shadowed replicas of the surface by means of an electron microscope. The weight change after heat treatment indicated that probably all of the zinc in the brass evaporated, and it is presumed that the islands are essentially pure copper.

In addition to nickel-plated molybdenum, several nickel-plated tungsten and copper-plated molybdenum specimens were prepared, using the brass strike. All of the samples showed good high temperature adherence.

DISCUSSION

It seems reasonable to assume that the blistering and buckling of the nickel-plate stems from two sources (1) the poor as-plated adhesion and (2) the large difference in the thermal expansion between molybdenum and nickel. The coefficient of thermal expansion of some of the metals as taken from Smithells[2] are as follows:

Metal	$\alpha \times 10^6$
molybdenum	4.9
tungsten	4.4
chromium	8.2
nickel	13.0
copper	16.4

* General Electric Research Laboratory, Schenectady, New York.

† Cyanide brass bath described in 1953 edition of Metal Finishing Handbook p. 246.

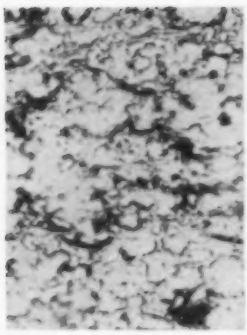

Fig. 2. Brass coating before heat treatment. 1500X

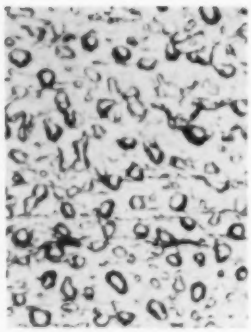

Fig. 3. Brass coating after heat treatment. 1500X

The problem of obtaining adherent nickel coatings appears to require the condition that the isolated regions where as-plated adherence exists prevent the buckling of the plate sufficiently long until a diffusion bond between the plate and the molybdenum is formed. High temperature adherence can be improved by (1) choosing an adherent intermediate plate or strike whose coefficient of thermal expansion is between that of molybdenum and the nickel or by (2) increasing the regions of as-plated adherence. The procedure employed by Korbelak employs the first method. Chromium has a favorable coefficient of expansion, and exhibits good as-plated adherence. Whereas nickel, after plating, can easily be stripped from the molybdenum backing, it is difficult, if not impossible, to strip the chromium by simple mechanical means. The chromium probably adheres well to the molybdenum because of the nature of the chromium plating bath and the matching crystal structure of chromium and molybdenum.

The brass strike process essentially employs the second method, i.e., increasing the number of regions of as-plated adherence. As Figure 3 shows, the process produces a large number of small copper particles dispersed on the molybdenum surface. The specimen shown in Figure 3 has about 10^7 of these particles per cm^2, which are presumably diffusion welded to the molybdenum. The nickel plated onto this surface has improved adherence at these regions. As the sample is heated, the adherence of the nickel at the copper regions increases very rapidly because of the ready intermetallic diffusion of copper and nickel. Thus the nickel plate is held down at the copper islands sufficiently long for the diffusion of the nickel into the molybdenum to become appreciable. Blistering and buckling is therefore eliminated.

The formation of the islands of copper is probably due to the poor wetting of copper on molybdenum. A copper coating on molybdenum heated to above the melting point of the copper readily agglomerates into islands. Below the melting point agglomeration is probably facilitated by the evaporation of the zinc.

The use of a discontinuous intermediate flash-coating may be a general method of obtaining high temperature adherence between two metals of widely different thermal coefficients. Upon heating the isolated region of the flash-coating can expand freely laterally without buckling, and diffusion can readily occur because of the continuous contact between the base metal and the flash-coating. When the discontinuous flash-coating is widely dispersed and the final plate is held down at the isolated regions, it is not possible to form blisters of any appreciable height. The relation between the radius of the base metal area encircled by the flash-coating regions or islands, and the maximum height of a blister that can form due to thermal expansion, is approximately:

$$h = r\sqrt{2\,\Delta\alpha\, t}$$

where h = height of blister
$\Delta\alpha$ = difference in thermal expansion of base metal and final plate
t = temperature
r = radius of area encircled by the islands

Referring to Figure 3, it can be seen that $r \sim 3\mu$; at 1000° C, h is therefore about 1.3×10^{-5} cm. A void of this size is easily eliminated by thermal diffusion.

The method described here of obtaining adherent electroplates on metals where there is a large difference in thermal expansion may be of use where a zone with a gradient thermal coefficient cannot be conveniently produced.

CONCLUSION

It has been demonstrated that adherent nickel plates of up to 0.030 cm in thickness can be produced on molybdenum by the use of a brass strike and heat treatment. During the heat treatment, the zinc evaporates and islands of copper are formed. It is proposed that the nickel plate is held down by these islands so that sufficient diffusion welding between the nickel and molybdenum can occur to prevent blistering and buckling.

ACKNOWLEDGMENTS

The author is indebted to W. R. Blackledge for his help in preparing the electroplated test specimens. He also thanks A. Holik for his assistance in the preparation of the photomicrographs.

REFERENCES

[1]Korbelak, A., Plating **40,** 1126 (1953).

[2]Smithells, C. J., Metals Reference Book, Interscience Publishers Inc., New York, p. 413 (1949).

S. S. Brenner was born in Germany in 1927. He obtained a BS degree in Metallurgy from MIT in 1951, and is a candidate for a PhD degree in Metallurgy, January 1957, from Rensselaer Polytechnic Institute. He has been a member of GE Research Laboratory staff since 1951, and his present position is Research Associate. At present, Brenner is studying the growth of "whisker" crystals and their mechanical behavior. Previous research activities were in the field of high temperature oxidation. Member of Sigma Xi and Phi Lambda Upsilon.

STRIPPABLE PARAFFIN WAX MASKING

By L. MISSEL*

INTRODUCTION

The use of strippable hot dip masking material for partial stop-off during electroplating has been largely confined to chlorinated paraffins and cellulose acetate-butyrate based material. These have great advantages, namely ease of application on any shape, ease of removal, essentially foolproof protection, high melting point, inertness to plating, inertness to processing solutions, and reusability.

However, the use of these versatile materials is restricted by the disadvantages of high initial material cost, gradual thermal decomposition, a requirement for high and well controlled heating, critical hooding requirements, extreme toxicity of the vapors from chlorinated paraffin, extremely disagreeable odor and excessive capacity requirements for the cellulose acetate-butyrate formulations due to great coating thickness.

The use of the strippable paraffin wax system described in this paper eliminates all the above noted disadvantages while retaining all the above noted advantages with the exception of lower melting point. This lower melting point masking has found continuous use in certain applications for over two years, with completely satisfactory results.

PRELIMINARY WORK

A proprietary chlorinated paraffin had been used for partial stop-off on large steel parts during the plating of thick chromium deposits with satisfactory results for a considerable time. However, it became necessary to find a substitute because of an acute toxicity problem. Along with the elimination of toxicity the prime requisites for a substitute process were easy application to the complex shapes involved and easy and foolproof strippability. The direct application of paraffin and other highly adherent waxes is unattractive because the large volume of work would necessitate a considerable installation for wax removal and because of a potential danger of incomplete removal particularly from blind holes and other inaccessible areas. This would lead to bare area in the subsequent cadmium plating. In addition the masking must provide essentially foolproof protection and be inert to plating and processing solutions.

It was decided that the most promising approach would be to use a parting agent between the metal and the wax. The first such material developed was a 1 per cent aqueous solution of polyvinyl alcohol applied by dipping. Use of this material was abandoned after several months production use because of some tendency toward corrosion of the steel, particularly on extended standing, occasional sticking in small areas and lack of parting ability on machined areas.

STRIPPABLE PARAFFIN WAX MASKING

A satisfactory parting solution was found in the following solution:

Sodium Carbonate	0.8 oz/gal
Sodium Chromate	0.8 oz/gal
†Sodium Lauryl Sulfate	0.3 oz/gal
Water	Balance

This satisfied not only the requirements of easy wax application and removal but was applicable on machined areas, and eliminated corrosion under the masking.

The part is dipped in the cold solution and then promptly dipped in the molten wax. High melting point ceresin (paraffin) wax‡ is highly satisfactory. The wax should be dyed** to aid in removal of excess. Multiple dipping can be used as required. The wax remains very pliable for about 15 minutes during which time it can be easily trimmed. Cooling is indicated by a very obvious color change. Some operators prefer to expedite the cooling by dipping in cold water. A high degree of shrinkage tightens the wax on the masked area. For a sharp parting line it is necessary to use the usual supplementary protection such as lead backed tape, shim stock, vinyl tape, etc. Stripping is expedited by heating to about 130° F, after which a cut is made and the wax can be removed in one tear by hand.

The wax is completely re-usable, inert to all plating and processing solutions, thermally stable, substantially lower in cost than other strippable masking, nontoxic, has no disagreeable odor and requires no critical hooding. It has a Cleveland Open Cup Flash Point of 460° F minimum.

To date, industrial experience has been with chromium plating, over a period of more than two years. However, there appears to be little doubt that this process with a change in the corrosion inhibiting constituents to eliminate danger of chromate contamination by the aqueous dip would give equally good result in any plating or processing solution operated up to 140° F. This is the practical temperature limitation of the wax. Such use necessitates lowering the operating temperature of cleaners, a change which was found satisfactory with the electrocleaners tried.

ACKNOWLEDGMENT

This work was done at and for Menasco Mfg. Co. of Burbank, California with whose permission this material is being published.

Leo Missel was graduated from City College of New York with a BS degree in Chemistry in 1936. He is a member of the AES and the Electrochemical Society and is employed as Manufacturing Research Engineer at Lockheed Missile Systems Division, California.

* Lockheed Missile Systems Division, Van Nuys, California.
† Duponol ME dry is satisfactory.
‡ Mobilwax Cerese Wax, General Petroleum Corp. at 170° F was used.
** Oil Soluble Red #322, Mefford Chemical Co. is stable in Sulfate Chromium bath

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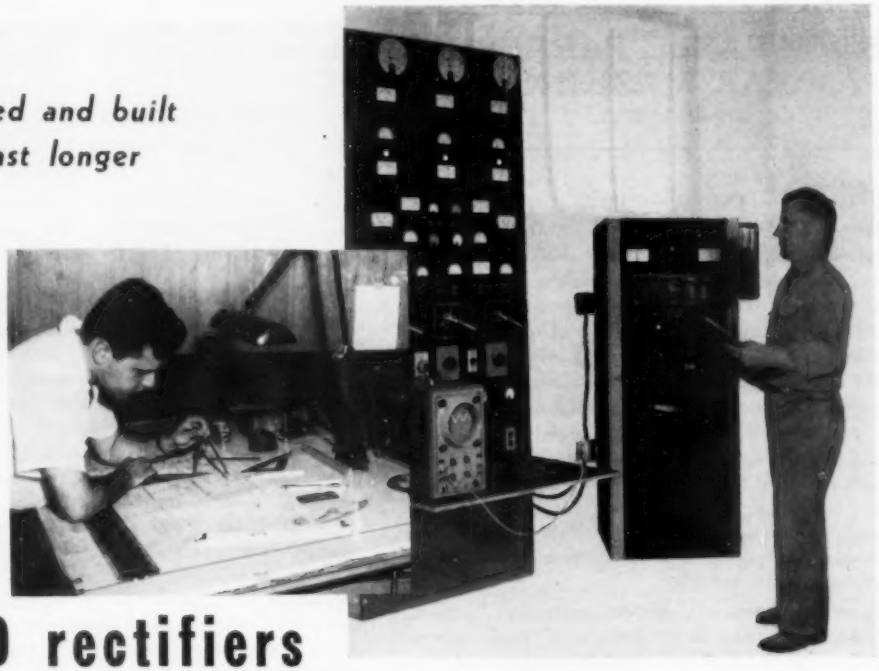

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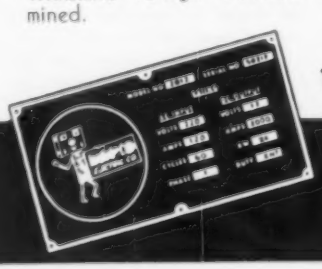
- **VOLTAGE REGULATION TEST**
  D. C. voltages are checked at no load and at full load to determine power unit stability. Steady voltage at the plating tank is thereby assured regardless of varying loads.

- **TRANSFORMER SECONDARIES**
  A.C. current to each stack is checked and balanced to within 0.5% of entire current range. Excessive loading is thereby curtailed while detecting excessive unbalance in the transformer.

- **RIPPLE VOLTAGE**
  The amount of permissable output ripple voltage of each phase, in a 3 phase rectifier is tested by providing a standard, individually balanced input voltage and current in each of three phases.



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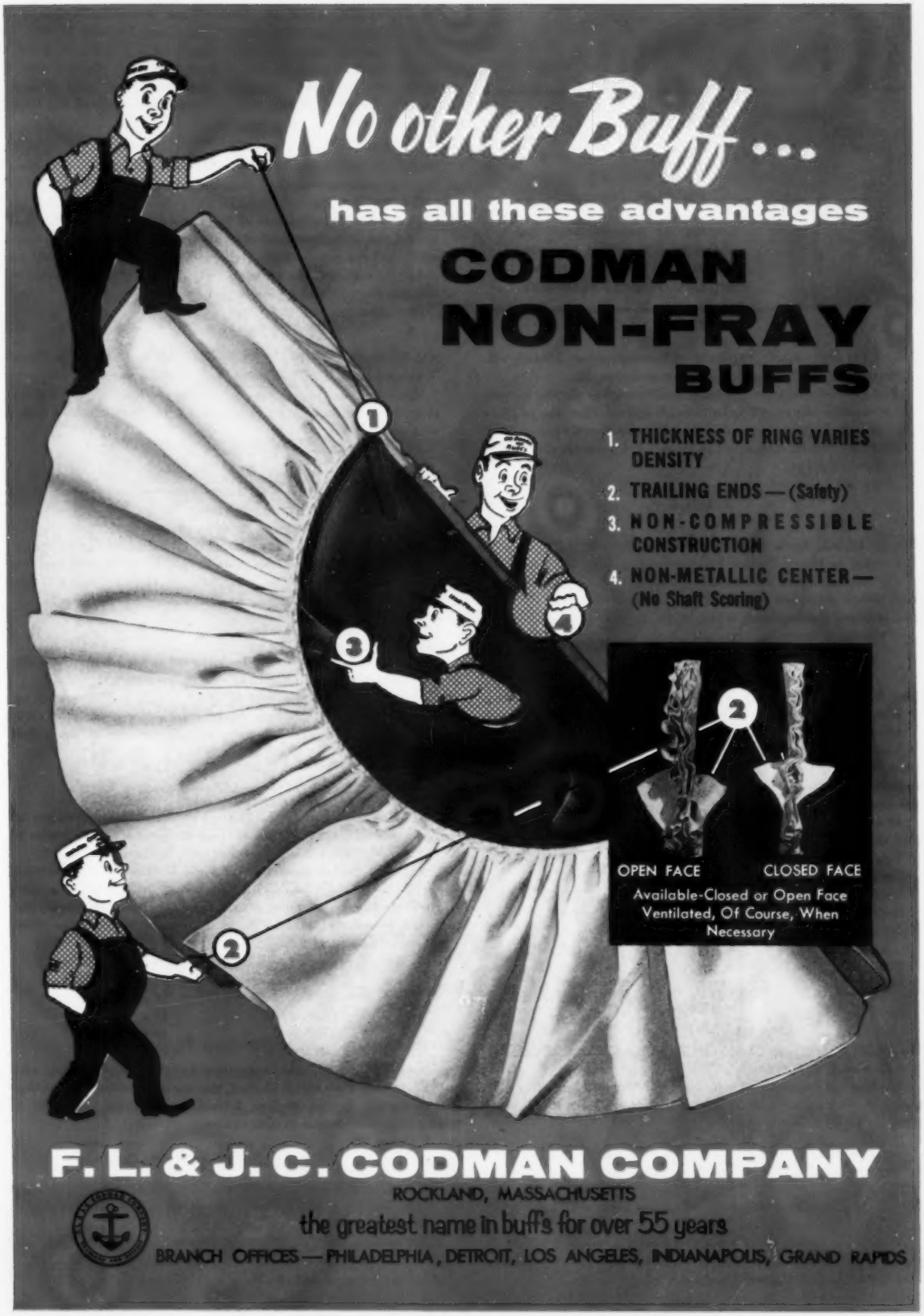
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PATENT ABSTRACTS

DR. D. GARDNER FOULKE
Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,741,586, April 10, 1956—Electroplating Metals—B. Sherwood, assignor to N. American Aviation, Inc.

The method consists of passing an alternating plating current of asymmetric sine wave form through the solution, the positive plating half cycle being greater than the negative de-plating half cycle in amplitude and equal in time. A schematic diagram of the circuit is given.

(4 claims, 2 figures)

—AES—

No. 2,741,463, April 10, 1956—Plating Barrel—L. Colclesser, assignor to Mercil Plating Equipment Co., Chicago, Ill.

The plating barrel has the sides integral with one another and each side is deformed radially inward to provide added strength and improve the tumbling action of the barrel.

(4 claims, 9 figures)

—AES—

No. 2,741,599, April 10, 1956—Composition for Cleaning and Stripping Print from Aluminum—L. McDonald and Alfred Howley, assignors to Kelite Corp., Los Angeles, Cal.

The composition consists of sodium carbonate and trisodium phosphate as activators, a sodium silicate as a corrosion inhibitor, sodium gluconate polymeric titramethylene phenyl sodium sulfonate and a wetting agent.

As an example the following was given to be used at 1–20 oz/gal and 160–180° F:

Trisodium phosphate . 1 H_2O	61.5 per cent
Sodium trisilicate	20.5
Sodium carbonate	8.0
Sodium gluconate	4.0
Polymerial tetramethylene phenyl sodium sulfonate	2.0
Potassium oleate	4.0

(5 claims)

—AES—

No. 2,741,019, April 10, 1956—Metallic Coating for Wire—C. Faust, assignor to USA

A solderable copper wire with high resistance to humidity and fungal growth is the result of plating with lead ($3–6 \times 10^{-5}$") then with tin ($5–20 \times 10^{-6}$").

1 claim.

—AES—

No. 2,741,250, April 10, 1956—Process for Pickling Metal—C. Rauh, Akron, Ohio.

A method for regenerating sulfuric acid pickling solution is described which involves heating by direct flame to concentrate and crystallize out the ferrous sulfate.

10 claims, figure.

No. 2,741,252, April 10, 1956—Work Treating Apparatus—J. Davis, assignor to the Udylite Corp., Detroit, Mich.

A horizontal rail pivotally mounted on a support on a horizontal, longitudinal axis over a tank lengthwise thereto with a work-carrying hook suspended from said rail and slidably keyed thereon—providing thereby for oscillation of rail and hook.

12 claims, drawing.

—AES—

No. 2,741,567, April 10, 1956—Metal Coating Composition for Titanium—G. Otto, assignor to American Chemical Paint Co., Ambler, Pa.

The essential ingredients of this consolute metal coating bath are 0.1 per cent–2 per cent of hydrofluoric, fluosilicic or fluoboric acids and 0.3 per cent–30 per cent of an organic lubricant resistant to action of the acids. The remainder is a solvent system also resistant to said acids.

19 claims.

—AES—

No. 2,741,585, April 10, 1956—Method for Marking Metal Strip—D. Metcalf, assignor to U. S. Steel Corp., N. J.

The equipment described permits the marking of plated metal strip, such as tinplate, by means of a burnishing brush mounted over rolls.

8 claims, figures.

—AES—

No. 2,741,590, April 10, 1956—Electrolytic Recovery of Manganese—R. Kunin, assignor to USA

The method involves electrolysis of a sulfuric acid solution containing manganese, iron and aluminum using an anion exchange membrane. See also No. 2,741,589 (6 claims) uranium by same patentee and No. 2,741,591, (15 claims) Dewey H and Gilliland, assigned to Ionics, Inc.

4 claims, figure.

—AES—

No. 2,741,594, April 10, 1956—Apparatus for Electrolytically Penetrating Shell Casings—C. Bowersett, Laurel, Md.

The apparatus is claimed to cut through shells without exploding them, the principle being rotating said shell which is anodic in a series of impinging cathodic streams of electrolyte upon said shell.

3 claims.

—AES—

No. 2,742,412, April 17, 1956—Electrolytic Deposition of Copper—R. Cransberg and H. Van Dosterhout, assignors to N. V. Metallic Industry, Loosdrecht, Netherlands.

A bright acid copper plating bath is claimed, the addition agents being thiourea, allylthiourea acetylthiourea along with glycerol, glycol, ethylene glycol monoethylether or diethylene glycol monobutyl ether. A softer copper result than when thiourea alone is used.

Example I gives the bath composition as:

$CuSO_4 \cdot 5$ ag	150 g/l
H_2SO_4	15 g/l
$(NH_4)_2 SO_4$	15 g/l
Thiourea	10 mg/l
Glycerol	95 mg/l

See also No. 2,742,413 to same inventors describing along with thiourea and derivatives thereof, the use of xanthine and methyl homologues, hexamethylene tetramine, pyridine (example I, 40 g/l) or morpholine in nine claims.

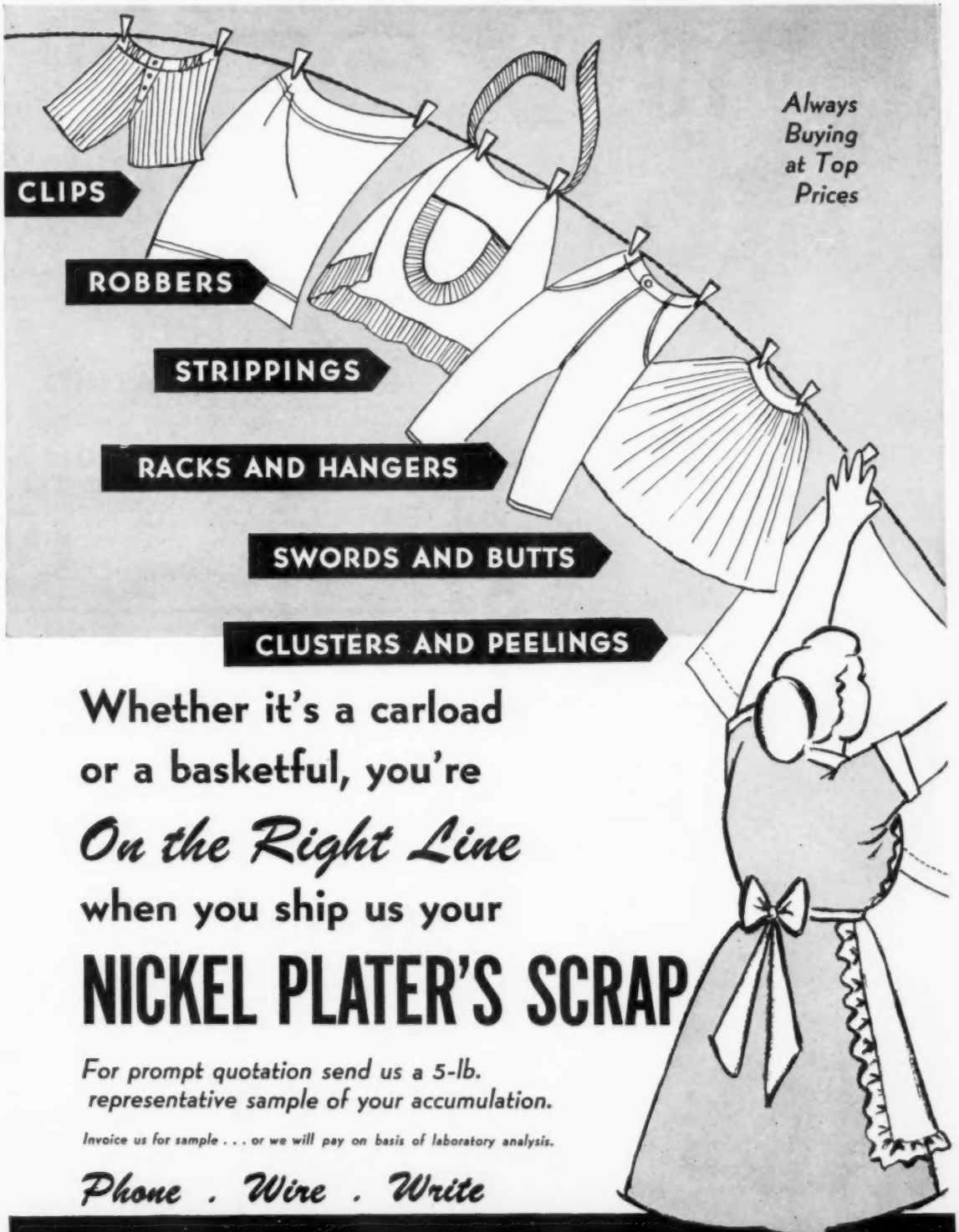
8 claims.

—AES—

No. 2,742,417, April 17, 1956—Apparatus for Electroplating—J. Shanley, assignor to National Steel Corporation, Delaware.

An improved strip plating apparatus is described which will provide anode alignment when different widths of strip or weaving strips are being plated.

2 claims, 7 figures.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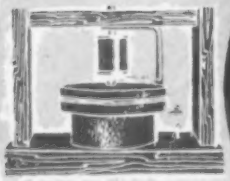

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PATENT ABSTRACTS

No. 2,744,063, May 1, 1956—Electrodeposition of Tin-Antimony-Copper Alloys—G. Shockley, assignor to General Motors Corp., Detroit, Mich.

Alloys of 2–12 per cent antimony and 1–8 per cent copper, rest tin may be deposited from baths containing: tin as fluoborate, 50–180 g/l; antimony as the fluoborate, 0.5–20 g/l; copper as the fluoborate, 0.5–20 g/l with 10–40 g/l of boric acid and sufficient fluoboric acid to reduce the pH below 1. In one claim beta naphthol and glue are mentioned as addition agents.

10 claims.

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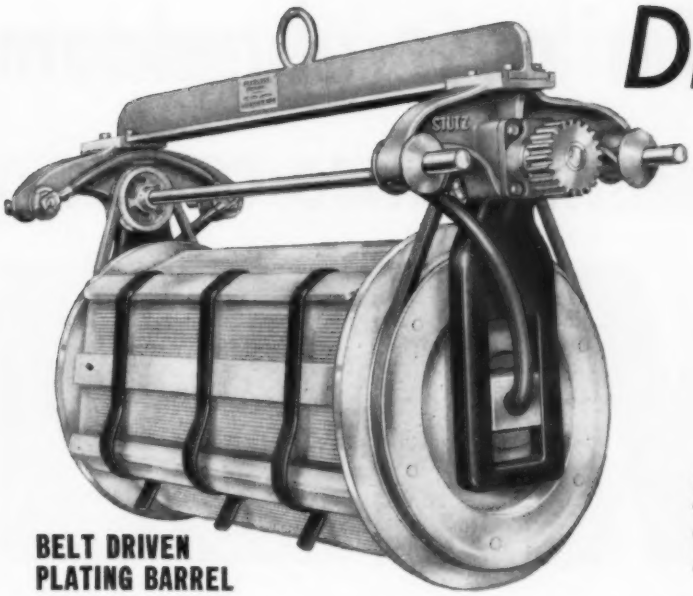

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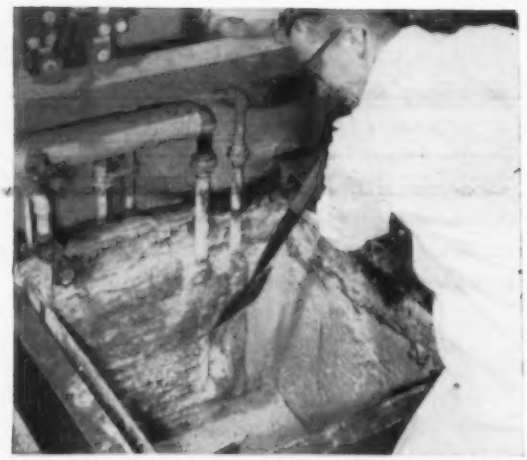

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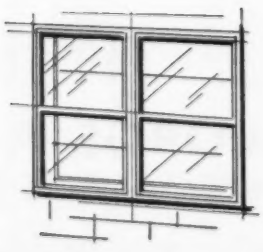

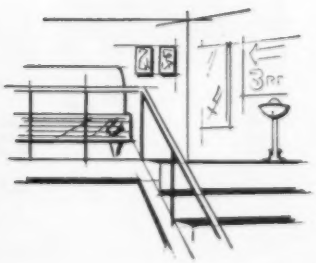

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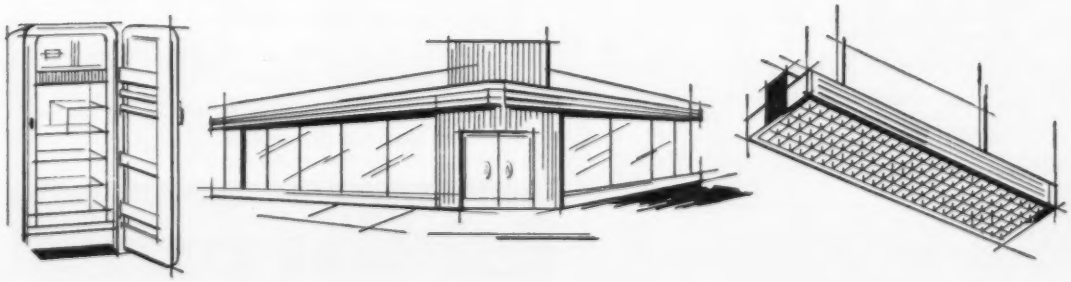

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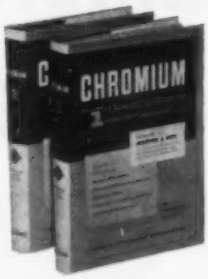

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Most of the articles listed here may be obtained by writing to the Publication. Addresses are included for the reader's convenience.

Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

134. ALLOYS

a. *THE ELECTRODEPOSITION OF TIN-CADMIUM ALLOYS FROM FLUORIDE-FLUOSILICATE SOLUTIONS*
A. E. Davies
Institute of Metal Finishing, Bulletin, *6*, Spring 1956, p. 31–42

b. *THE ELECTRODEPOSITION OF TIN-CADMIUM ALLOYS FROM STANNATE-CYANIDE SOLUTIONS*
A. E. Davies
Institute of Metal Finishing, Bulletin, *6*, Spring 1956, p. 43–58

135. ANODIZING

a. *SURFACE TREATMENT AND FINISHING OF LIGHT METALS. IX. COLORING ANODIC COATINGS*
S. Wernick and R. Pinner
Metal Finishing, July 1956, *54*, No. 7, p. 48–53

136. CHROMIUM

a. *INVESTIGATION OF CHROMIUM PLATING BATHS OF COMBINED TYPE* (*Russian*)
N. T. Drobantseva and A. N. Sysoev
Zhurnal Prikladnoi Khimii, *29*, No. 4, April 1956, p. 589–595.
Effect of H_2SiF_6 and other additions to the chromic acid on thickness and texture of chromium deposits. Relation of current density and temperature to yield for standard and combined baths. Diagram, micrographs, graphs, 14 ref.

137. COPPER

a. *A STUDY OF WHISKER FORMATION IN THE ELECTRODEPOSITION OF COPPER*
P. A. Van Der Meulen and H. V. Lindstrom
Journal of the Electrochemical Society, July 1956, *103*, No. 7, p. 390–395

138. CORROSION

a. *PITTING CORROSION OF 18Cr-8Ni STAINLESS STEEL*
M. A. Streicher
Journal of the Electrochemical Society, July 1956, *103*, No. 7, p. 375–390

139. ELECTROPOLISHING

a. *THE NATURE OF THE FILM FORMED ON COPPER DURING ELECTROPOLISHING*
E. C. Williams and Marjorie A. Barrett
Journal of the Electrochemical Society, *103*, No. 7, p. 363–366

140. FINISHING

a. *SURFACE FINISHES FOR STAINLESS STEELS*
Kenneth M. Huston
Products Finishing, July 1956, p. 24–38

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ARTICLE REFERENCES

141. ORGANICS

a. *WATER REDUCIBLE COATINGS FOR INDUSTRIAL FINISHING*
Gerould Allyn
Products Finishing, July 1956, p. 40–45

b. *WHY WRINKLES WRINKLE*
Harry Burrell
Organic Finishing, July 1956, p. 13–17

142. PLATING

a. *HOW TO GET MORE FOR YOUR METALWORKING DOLLAR*
Number 5 of a series
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143. TIN

a. *PLATING TIN ON ALUMINUM*
J. M. Bryan
Metal Finishing, 54, No. 7, July 1956, p. 54–56

144. VENTILATION

a. *VENTILATION*
J. B. Mohler
Metal Finishing, 54, No. 7, July 1956, p. 57–60

145. The following are Metallurgical Abstracts taken from The Journal of the Institute of Metals, May 1956.

a. *FRETTING AND FRETTING CORROSION*

J. van der Hoek

(Polytechn. Tijdschr., 1955, 10, (37/38), 908a–911a)

After definitions have been given, the phenomena of fretting and fretting corrosion are described. Among materials having low resistance to fretting are steel, Ni, Al, Al-Si alloy, Sb, Sn, Zn plate and Fe plate on steel, and Al on Al, while Pb, Ag plate and "Parkolubrated" steel on steel, and Ag plate on Al plate have high resistance. Tests were made with mineral and synthetic oil lubricants to determine their effect and some results are tabulated.

b. *FERROCYANIDE ELECTROLYTE FOR SILVER PLATING*

V. I. Semeryuk

(Zhur. Priklad. Khim., 1955, 28, (11), 1240–1242)—(In Russian)

Ag plating from a bath containing AgCl 5–10, $K_4Fe(CN)_6$ 10–20 Na_2CO_3 10–20 g/l was described by Yampol'sky ("Gal'vanotekhnika," 1952, p. 22), insoluble anodes of C being used.

Following are the addresses of the publications named in the Article Reference above.

Requests for articles should be made directly to the publication.

Institute of Metal Finishing Bulletin
32 Gt. Ormond St.
London, W.C. 1, England

J. Electrochemical Society
216 W. 102nd St.
New York, N. Y.

J. Institute of Metals
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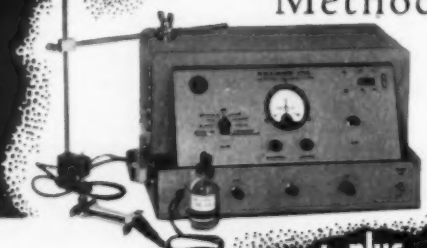

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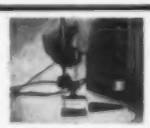
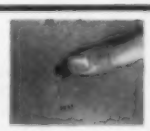
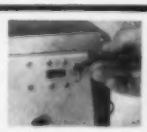
1. MOUNT THE CELL . . . on the spot to be tested and clip lead wire to specimen.

2. ADD TEST SOLUTION . . . which corresponds to the type of plating and base metal tested.


3. PLACE STIRRER IN POSITION.

4. SET SELECTOR SWITCH to the type of plating to be tested as indicated on panel.


5. PRESS THE TEST BUTTON to start the test . . . and upon completion the unit shuts off automatically.


6. TAKE THE READING directly from the counter on panel i.e., 0.00041"

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INTERSOCIETY NEWS

32nd SESSION OF INSTITUTE OF METAL FINISHING

The Institute of Metal Finishing, London, England, has announced the following arrangements for open meetings of all branches which will be held during September, October 1956.

September 10—London Branch

Time and Place

Northampton Polytechnic, St. John Street, London, E. C. 1, commencing at 6.15 p.m.

Subject and Speaker

DEBATE: "That this meeting is of the opinion that bright anodized aluminum will rapidly replace nickel/chromium finishes." Proposed by I. Walker and E. E. Spillett. Opposed by H. C. Castell and T. E. Such.

September 4—Midland Branch

Time and Place

James Watts Memorial Institute, Great Charles St., Birmingham, at 6.30 p.m.

Subject and Speaker

Chairman's Address. By F. Wild, AIM.

September 6—North-West Branch

Time and Place

Engineers' Club, Albert Square, Manchester, at 7.30 p.m.

Subject and Speaker

Address by the President. R. A. F. Hammond, BSc, ARCS, FRIC.

September 28—Sheffield & North-East Branch

Time and Place

Grand Hotel (Fitzwilliam Room), Sheffield, at 7 p.m.

Subject and Speaker

Zinc Plating. By D. N. Layton, PhD, MSc, ARCS, DIC, A. Inst. P.

October 3—Scottish Branch

Time and Place

Institution of Engineers & Shipbuilders in Scotland, 39 Elmbank Crescent, Glasgow, at 7.30 p.m.

Subject and Speaker

Chairman's Address. By W. Watson, BSc.

October 4—Organic Finishing Group Branch

Time and Place

Joint works visit and meeting with North-West Branch. Afternoon visit to John Summers & Sons Ltd., Shotton, Chester.

At the Engineers' Club, Albert Square, Manchester, at 7.30 p.m.

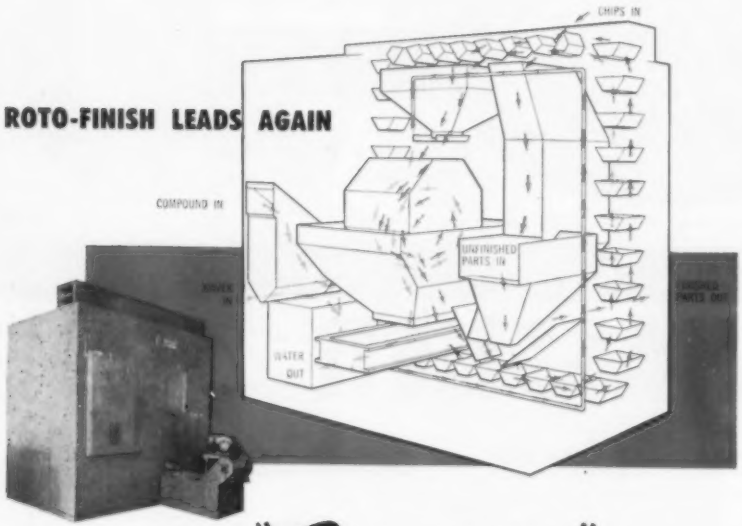
Subject and Speaker

The Evaluation of a Variety of Finishes on Electro-Zinc Plate. By P. Costelloe.

LARGEST ATTENDANCE ON RECORD MARKS ASTM 59th ANNUAL MEETING

With a record registered attendance of 2896, the American Society for Testing Materials concluded its 59th Annual Meeting at Atlantic City on June 22. The Apparatus Exhibit held in conjunction with the meeting was also one of the largest ever held by the Society with 44 different exhibitors. At the week-long meeting, the Society held 32 technical sessions and approximately 700 technical committee meetings. The vigorous work of the Society's technical committees for many months was concluded with the presentation of their reports at the meeting.

Highlighting the technical program were the educational Marburg Lecture presented by Charles E. Reed on "The Industrial Chemistry, Properties, and Applications of Silicones"; the H. W. Gillett Memorial Lecture by D. K. Crampton, "Structural Chemistry and Metallurgy of Copper"; and a symposium on solder reported to include some of the most important discoveries on this subject for several years.



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- Suitable for straight line production.
- Thus, "Rotomation" barrel finishing machine becomes a machine tool.

Roto-Finish COMPANY

3703 MILHAM ROAD, KALAMAZOO, MICH.

P. O. Box 988 — Phone 3-5578

ORIGINATORS OF THE ROTO-FINISH PROCESS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 960.

ACHESON AWARD WON BY DR. R. M. BURNS

Robert M. Burns of Summit, N. J., has been selected to receive the Edward Goodrich Acheson Gold Medal and Prize of The Electrochemical Society, Inc. Presentation of the medal and prize of one thousand dollars will be made at a dinner to be held on October 2, 1956, at which Dr. Burns will deliver the Acheson Medal Address. This will be the 110th Meeting of the Society to be held in Cleveland, Ohio, September 30–October 4, 1956.

The Acheson Award is made once every two years for conspicuous "contribution to the advancement of the objects, purposes, or activities" of the Society.

Dr. Burns, formerly Chemical Director of Bell Telephone Laboratories, is now a Scientific Advisor to Stanford Research Institute and to the Sprague Electric Company.

PARIS CONFERENCE

The annual Hard Chrome Conference of the Centre D'Information Du Chrome Dur took place on May 4 at the Maison de la Chimie (Paris) under the chairmanship of Monsieur l'Ingenieur Général Salmon. This meeting, attended by a large group, heard four papers presented by Madame A. R. Weill and Messrs. Bonnemay, Caillot and Morisset.

Morisset

Madame Weill, who is the contracting engineer for Naval construction, presented a paper on "X-ray Examination of Electrolytic Deposits of Chromium on Steel."

Bonnemay, who is Assistant Director of the Electrodeposition Laboratories of CNRS, presented a paper on "Studies on the Porosity of Chromium Deposits."

Bonnemay

Weill

Caillot, who is a Director of the Laboratories of the Technical Union of Automobiles and Cycles, presented a paper on "Bright and Dull Chromium Plating of Light Alloys."

Morisset, who is Director of the Centre d'Information du Chrome Dur, presented a paper on the "Effect of Hard Chrome Plating on the Wearability of Steels."

CLASSIFIED ADVERTISEMENTS

Only "Help Wanted" and "Situations Wanted" will be accepted. Rates: $.20 per word, minimum $5.00. AES branch members and members-at-large only, in good standing, are entitled to a total of three *free* advertisements in any twelve month period as of first insertion. Last day for inserting advertisements is the 10th of month preceding date of publication. When answering advertisements please address as follows: Box number, PLATING, 445 Broad Street, Newark 2, N. J.

ELECTRO-PLATING SUPERVISOR—Must be thoroughly familiar with copper, nickel, chromium and precious metal plating on a high quality jewelry type product. Familiarity with automatic equipment desirable, but not essential. Reply to Box S1, PLATING, 445 Broad St., Newark, N. J.

WANTED—Experienced plating and polishing man with money to invest to replace production partner who is retiring. Must be familiar with job shop work. Reply to Box S2, PLATING, 445 Broad St., Newark 2, N. J.

SALESMAN WANTED—Swiss Chemist 27, with diploma, seeks position in U.S.A. 5 years supervisor. Technical and practical experience in pretreatment, electroplating (Cu/Ni/Zn/Cd/Ag/Pb/Rhodium) and varnishing. Every analytical work. Reply to Box S3, PLATING, 445 Broad St., Newark 2, N. J.

SITUATION WANTED—Situation open Distributors, jobbers and manufacturers agents wanted to distribute and sell a full line of chelating agents to the electroplating industry. All territories open. Reply to Box S4, PLATING, 445 Broad St., Newark 2, N. J.

Get It Wet!

You've got to get water into and all around the soil, if you're going to wash soil off metal parts and surfaces. That's what makes

Cowles

NEW QC
WASHING MACHINE
CLEANER

a *completely different* kind of alkaline washing machine cleaner.

Cowles QC Washing Machine Cleaner "wets" the soil faster—loosens it more thoroughly—emulsifies it more completely.

All this . . . *without objectionable foaming!*

Get the complete story on this *brand* NEW Cowles QC Washing Machine Cleaner. Send this coupon.

Cowles Chemical Company
7018 Euclid Avenue
Cleveland 3, Ohio
Please send Cowles QC Bulletin

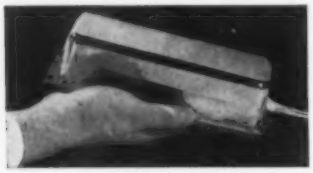
Name_____
Company_____
Address_____
City_____ State_____

Cowles CHEMICAL COMPANY
Cleveland 3, Ohio

See Cowles' other advertisements on pages 1127 and 1166.

ULTRASONIC CLEANING BY THE SQUARE FOOT

Recent improvements in ultrasonic power-generating equipment, and the perfection of hermetically-sealed transducers operating at 40 kc/sec, have now made it economically feasible to apply ultrasonic cleaning to areas measured by the square foot. Up to now, cost and technical problems have largely confined the benefits of this fast and efficient technique to relatively small units.



The large, uniform radiating surface of the transducers makes them particularly suitable for the removal of buffing compounds, radioactive contamination, soldering flux, plaster, carbon smut, etc. The transducers can also be used for other processes such as quenching, plating, pickling, descaling and dyeing. The cleaning action penetrates deeply into blind holes and other areas difficult or impossible to clean by conventional methods.

The Branson LF-15 Transducers have a radiating surface 2⅝"x6", with thick barium-titanate driving elements that transmit the energy through the top of the stainless-steel housing directly into the cleaning solvent. The modular design of the transducers facilitates a wide choice of flush and focused arrangements of banked transducers. Generator-Transducers combinations are available with radiating areas from 0.25 to 10 square feet:

Sonogen® Model	Transducer Radiating Area Square Ft.
AP-25	0.25
APT-100	1.00
APT-400	4.00
P-1000	10.00

Cost of complete equipment, per square inch of radiating surface, ranges from $23 down to $14. We will be happy to send you complete information on request.

BRANSON ULTRASONIC CORPORATION
22 Brown House Road, Stamford, Connecticut

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 962.

INTERSOCIETY NEWS

DIE CASTERS PLAN FIRST STAG OUTING

A full day of activity is planned by the Detroit-Saginaw Valley chapter of the Society of Die Casting Engineers on September 12th at the Bob-O-Link Golf Club. Frank S. Marra, chairman of the Special Events Committee, has announced that the society's first annual stag day will feature a complete program of outdoor activities including golf, baseball and horseshoes. SDCE members and their guests will be treated to a fine buffet luncheon as well as a complete steak dinner.

Following the dinner, John Lapin, chapter chairman, will announce plans for the 1956-57 season of technical meetings which will begin in October. Valuable door prizes will also be distributed.

Here's the Polarizer YOU asked us for!

Low cost — completely portable, yet it does everything you need!

Two years ago we brought out polarizers for electro-platers to use in making rapid, accurate analyses of their plating solutions. As we told you at the time . . .

The C-1 Gave You FULLY ADVANCED Research-Control
. . . because we developed it out of our own long experience as contract and production platers, and because test models had been very well received by large plating concerns.

But You Told Us It Gave You Far MORE Than You Needed
When we talked to you—the plating men on the firing line—you told us you didn't need expensive additional research features. You needed a small, self-contained instrument to tell you the exact metallic content of your plating solutions.

So Here's the Patwin C-2—Just What YOU Asked For!
In two steps you get the answer: take the current reading on the microammeter; read the analysis on the scale in the Patwin "Cook-Book" Manual. It takes only a couple of minutes; there are no complications.

No Connections Needed! It's Entirely Self-Contained!
This new Patwin C-2 Polarizer doesn't have to be plugged in! It runs on three 1½-volt Burgess batteries. Its range is: 0-10-20-30-50-100 microamperes full scale. The sensitivity on direct reading is .1 microampere. Case is 14" x 8" x 8", and is finished in gray hammertone finish on steel—bonderized and primed. For full details, send in the coupon today!

The Patent Button Company **Waterbury 20, Conn.**

PATWIN INSTRUMENTS Division
THE PATENT BUTTON COMPANY, WATERBURY 20, CONNECTICUT
Please send me full information on your new Patwin C-2 Portable Polarizer.

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FIRM_____

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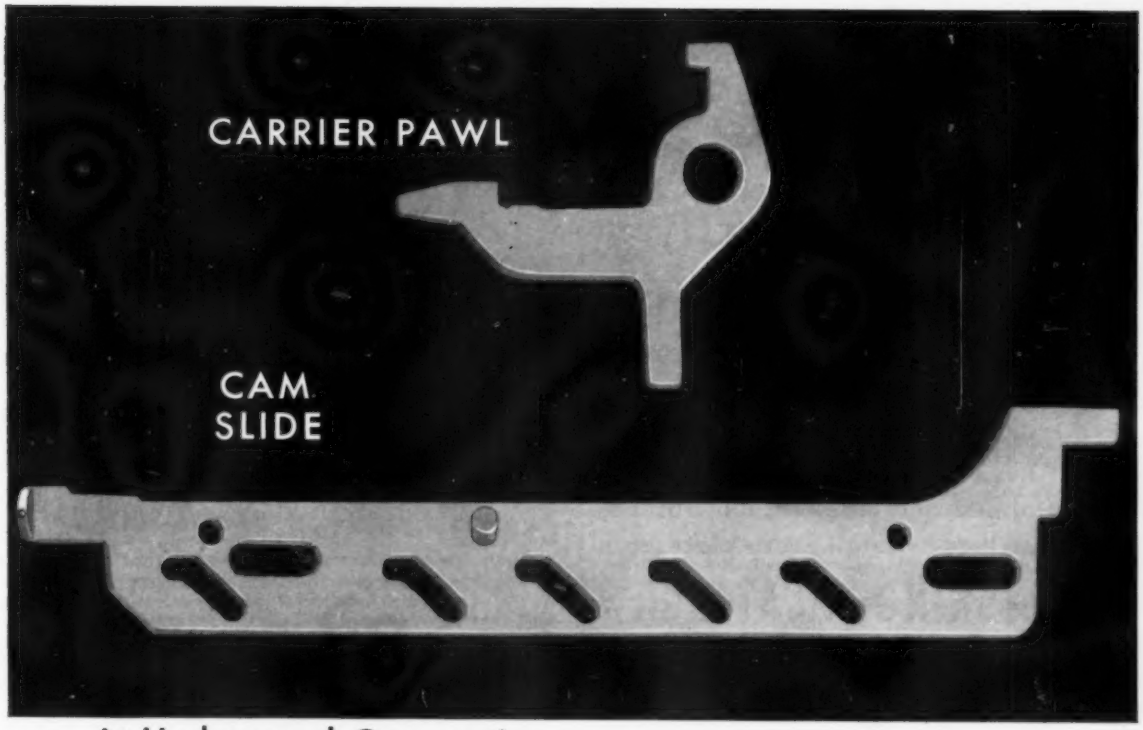
CITY_____ STATE_____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 963.



At Underwood Corporation . . .

HONITE Method Saves $11,750 On Finishing Precision Stampings

The Underwood Corporation, Bridgeport, Conn., puts 1000 *different* precision-made parts into their standard adding machine. Recently this company switched to the Honite barrel finishing method . . . and look at some typical results!

CARRIER PAWL About 1,000,000 of these cold-rolled steel parts are made each year. By the old combination of hand-finishing and tumbling methods, it required 15 separate operations to make each pawl — from blank to finish-plated. With the Honite Method, the *total* number of steps has been cut to 6 — with an annual saving on this part alone of $11,750!

CAM SLIDE The sides of this cold-rolled steel part must be exceedingly smooth because they are in direct contact with other surfaces, and tolerances must be held to .002" - .003". The old hand-honing method required 3900 man-hours per year to produce these parts. The Honite barrel finishing method has cut the total annual man-hours to 500!

The average overall cost for finishing parts by the old method varied from $.70 to $1.10 per 100 pieces. With the Honite barrel finishing method costs were cut to an average of $.10 per 100 pieces — a 91% saving. The company's investment in Honite barrel finishing equipment was thus paid off in *less than a year!*

You, too, can cut costs with the Honite barrel finishing method. Send coupon today for full facts.

Honite GRAND

Made in U.S.A. by
MINNESOTA MINING AND MFG. CO.
General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City.

MINNESOTA MINING AND MANUFACTURING CO.
Dept. FC-96, St. Paul 6, Minn.

☐ *Send me free copy of "Facts and Figures Report on Honite Barrel Finishing."*

☐ *I'd like to talk to a Honite Sales Engineer.*

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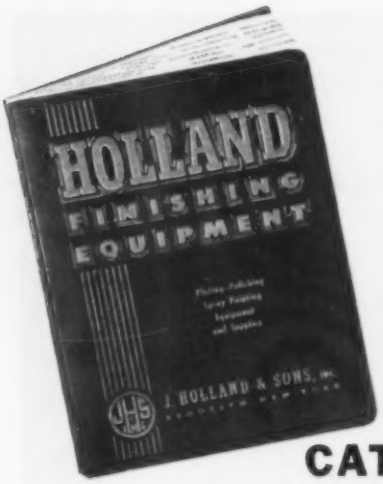

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(tabbed and indexed) illustrates and describes in detail every piece of

POLISHING, PLATING and SPRAY EQUIPMENT

that is available to you for

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Binks Spray Equipt.
Blowers, Exhaust
Burnishing Barrels
Boxes, Sawdust
Brass Plating Equipt.
Bus Bar
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Cadmium Plating Equipt.
Centrifugal Dryers
Chrome Plating Equipt.
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Heaters
Heating Coils
Heat Exchangers
Hoods, Exhaust
Immersion Heaters
Meters
Motor Driven Equipt.
Motors
Motor Generators
Ovens, Conveyor, Batch
Panels, Control
Pickling Equipment
Plating Barrels
Polishing Lathes
Pumps
Rectifiers
Rheostats
Rhodium Plating Equipt.
Sawdust & Dryers
Scratch Brushes
Silver Plating Equipt.
Spray Booths
Spray Equipment
Tanks, all types
Turntables
Tygon Paints
Tygon Thinners
Tygon Linings
Tygon Rack Coatings
Valves
Voltmeters
Wire Baskets
etc.

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J. Holland & Sons, Inc., 475 Keap St., Brooklyn 11, N. Y.

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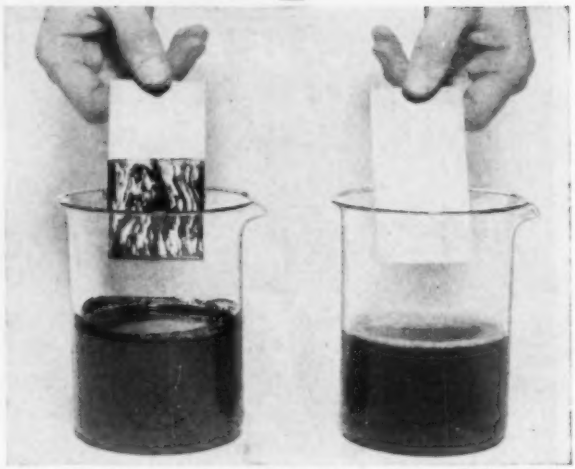
LEADERS IN FINISHING EQUIPMENT FOR OVER HALF A CENTURY

Pre-cleaning for Automatic Plating Lines



WHY YOU MAY BE GETTING TOO MANY REJECTS. *Difference in rinsing properties of two cleaners is clearly shown above. Beaker at left contains a conventional cleaner in general use. Beaker at right contains a solution of Diversey 909 Heavy Duty Cleaner. Identical amounts of grease and dirt are added to each beaker. Notice how soil clings to metal strip inserted in conventional cleaner, while work dipped in Diversey 909 at right is free of waterbreaks.*

How Free-Rinse Process

CUTS COSTLY REJECTS

Automatic plating lines put unusually heavy demands on cleaning materials. Cleaners that lack fast wetting action can't do a thorough cleaning job within the fixed limits of the automatic cycle. Cleaners that lack free-rinsing properties will cause "drag-out" that contaminates other tanks and causes rejects. Many cleaners lack capacity to hold large amounts of contamination, which means frequent shutdowns of the line to dump solution. Unstable cleaners cause constant adjustment and titration problems.

To meet the strict demands for cleaning in automatic lines, The Diversey Corporation has developed a series of cleaners that eliminate these serious problems and produce far superior results at lower overall costs. The Diversey process includes the following recommended cleaners:

For pre-soaking: Diversey #909 Heavy Duty Cleaner. Advantages—faster wetting action which means that cleaning starts sooner; longer solution life due to high capacity for holding contamination; free-draining and rinsing, eliminating problems of "drag-out"; non-caustic, safe to handle.

For electro-cleaning: Diversey #12 Electro-Cleaner. Advantages—faster acting due to excellent current-carrying capacity; controls foaming, thus reducing explosion danger caused by build-up of gas under heavy foam blankets.

For spray-cleaning: Diversey #519 Spray Cleaner. Advantages—faster wetting action, better emulsification; long solution life; free rinsing without waterbreaks; non-caustic.

Your nearby Diversey D-Man will be glad to demonstrate how the Diversey process will give you (a) superior cleaning, (b) easier and more effective control due to the uniformity of solutions, (c) longer runs without shutdowns. For free illustrated brochures on Diversey metal cleaners, write today on your letterhead to Metal Industries Department, The Diversey Corporation, 1820 Roscoe St., Chicago 13, Illinois.

MEET MR. PRESIDENT

GEORGE COLOMBIE
Hartford Branch

The Hartford Branch has installed **George Colombie** as its President for the 1956–57 meeting year. George, like all of his predecessors in this highly regarded position, has an interesting background.

He was born in Torrington, Conn., in July 1912 and attended grade and high schools in his birthplace. He furthered his education through University of Connecticut extension courses and completed an I.C.S. course in chemistry. His work life commenced with the plating department of the Torrington Company where he served as assistant foreman for ten years.

His adventuresome nature then asserted itself, and he took a fling at the insurance business at which he had considerable success. His first love called very strongly, however, and he returned to the plating field and settled down with Apothecaries Hall Company of Waterbury, Conn., where he is doing an outstanding job of sales engineering.

As for his AES functions, he joined the Waterbury Branch in 1935; and, when he returned to our industry, joined the Hartford Branch in 1946. Because of his husky appearance and disarming smile, he was made sergeant at arms and specialized in chasing the bar-flies into the educational sessions. After several years of this activity, the Hartford Branch realized the potential that was being wasted and put George to work on educational committees and thence through the various offices. He has also helped run several New England Regional Meetings and attends National Conventions.

George is married and lives in Torrington, Conn. His hobby is very unique for a burly plating sales engineer. This hobby is dogs (not the type the average plater might be interested in) but show dogs. His dogs have won at least thirty-five blue ribbons and the piece de resistance was winning a prize at Morris-Essex in 1941. This show is the World Series of this type competition and includes the cream of society as well as our Hartford Branch President.

PERMA BLACK—process for blacking stainless steels, cast iron, malleable iron and other steels; temperature range 245–250° F.

LUSTRE BLACK—process blacking bath for ferrous steels at 280–300° F., single tank operation.

ESTOX 5 SOAK OR PRESSURE CLEANER—for removing soils, greases and light carbon. A versatile product for light or heavy cleaning.

ESTOX 12 HEAVY DUTY FERROUS SOAK CLEANER—for cleaning before electroplating. Excellent oil and dirt removal. Long life.

ESTOX 8 MAGNESIUM SOAK CLEANER—a carefully compounded formulation for soak cleaning magnesium and spray stripping paint.

ESTOX 28 BARREL FINISHING COMPOUND—for barrel burnishing brass, copper, nickel, silver, gold. Maximum lubrication and free rinsing eliminate spotting from hard water—give uniform results.

ESTOX 110 WASHING MACHINE CLEANER—a superior cleaner for all industrial washing machines.

ESTOX 124 DRY WALL PAINT BOOTH COATING—for facilitating removal of lacquer, shellac, varnish, or enamel over-spray from paint booth walls. Eliminates scraping. Non-toxic.

ESTOX 130 PAINT DEFLOCCULATOR—to keep headers and nozzles in paint booths open for maximum atomization. Water soluble.

ESTOX 150 GLASS CLEANER—A combination of alkaline salts and wetting agents with additives to remove tarnish from sheet or plate glass.

ESTOX 163 PHOSPHATE COATING—to clean and coat iron phosphate on ferrous materials. Fine grained for ideal paint base.

ESTOX 170 DEOXIDIZER AND BRIGHTENER—designed to deoxidize aluminum or brighten copper and brass. Easily handled in dry form. Non-hazardous.

ESTOX 193 RUST PREVENTATIVE—a new product to prevent rusting of ferrous materials. Extremely economical to use.

ESTOX 196 WATER DISPLACING OIL—a new product for use where a light oil with high corrosion resistance is desired.

ESTOX 198 LUSTROUS WAX COATING—a hard, protective coating for black oxided metal surfaces. Excellent adhesive qualities.

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AES NEWS

Philadelphia branch, AES, will hold its annual educational session and banquet at The Benjamin Franklin Hotel, scene of the 1953 AES convention, on Saturday, October 20.

The afternoon educational session under the direction of **Dr. A. Kenneth Graham,** president of Graham, Crowley & Associates and former AES executive secretary, will feature three papers on nickel and multiple coatings.

A banquet, show and dance will follow in the evening.

SAMUEL HERRICK

The AES mourns the passing of Samuel Herrick, a member of the San Francisco Branch and a lifetime member of the Society, who died recently from a heart ailment in San Jose, California. The ailment reportedly was brought on years ago when he suffered cyanide poisoning while at work.

Herrick had resided in San Jose for 28 years and had operated the San Jose Plating Works. During World War II, he worked as a chemist with Food Machinery and Chemical Co.

COMMITTEE APPOINTMENTS MADE BY PRESIDENT SAMUEL HEIMAN, JULY 24, 1956

LIAISON WITH OTHER SOCIETIES

(Inter-Society Representatives) 1956–1957

J. P. Nichols

AES Representative to ASTM

G. E. Best

AES Representative to ASTM, Committee D-19, Industrial Water

Dr. W. R. Meyer

W. L. Pinner

AES Representative to the International Council for Electrodeposition and Institute of Metal Finishing

G. Schore

AES Representative to ASA, Committee Z-74, Performance of Effluent Air and Gas Cleaning Equipment

E. Combs

AES Representative to ASA, Committee B-73, Centrifugal Pumps for Chemical Industry Use

meet our star salesman

Our best "door-opener" and "contract-closer" is the product itself. On its merits it has built us a "blue chip" customer list.

Why not see for yourself how good BFC Chromic Acid really is by sending us an order to cover your next spot need?

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R. Morrison

F. Tirendi

L. Glassner

D. X. Clarin

On July 25, David X. Clarin, widely known as "Aunt Ella" suffered a stroke of his right side. He has been under care at Presbyterian Hospital in NewYork and is recuperating. All his friends in the AES wish him the best.

FRED W. WAGNER

On Friday evening, August 3, Fred W. Wagner took off from Pontiac, Mich., in the company plane. He was bound for Higgins Lake where he had intended to spend the week-end with his wife and five children. He crashed enroute and was not found until Sunday, August 5.

Fred is well known in the plating industry as Vice-President and Sales Manager of Wagner Brothers, Inc. There was rarely an affair at which Fred was not present. He will be missed by his many, many friends in the AES and the industry.

Photo courtesy: Hanson-Van Winkle-Munning Co.

PERMANENT PROTECTION . . .
. . . Against Corrosion, Contamination, Abrasion

Manhattan Rubber Linings give you the kind of cost-saving protection you need in metal plating and pickling operations. They are made from multiple calendered sheets of rubber, bonded so securely mechanical pull tests prove they can't be separated! This means you get *lasting* protection against corrosion of your equipment or contamination of solutions used in processing . . . *positive* protection from the dangers of stray currents in plating operations. It's the kind of *permanent* protection that has kept many Manhattan Rubber Lined plating tanks in continuous use for over 30 years!

Any equipment that can be shipped can be lined by Manhattan. Every tank lined by Manhattan is tested under high voltage to detect any possible imperfections before it is shipped back to your plant.

For perfect, bonded protection of your costly equipment . . . *permanent* protection against corrosion, contamination and abrasion . . . consult the R/M rubber lining plant nearest you.

RM 923

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AES MEMBERSHIP REPORT

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Chicago: A. G. Cafferty, D. Congreve, E. A. Durand, P. Kaftol, K. F. Machacek, D. E. Metheny, W. L. Overstreet, D. A. Schroeder, A. Shumicki, C. Sigl, A. J. Williams, Jr.

Cleveland: J. Matas, H. C. Yaeger

Houston: G. R. King

Melbourne: N. R. Croke, F. Pittard, M. A. Seggie, J. N. Watts

Mississippi Valley: G. S. Holland

Newark: W. J. Casler, J. W. Cirello, J. Gubnitsky, W. J. Jubanowsky, P. J. Kearns, J. Rosellini, G. Urucinitz

Philadelphia: J. W. Carroll, J. J. Obrzut

Saginaw Valley: P. C. Horton, C. T. Root, G. E. Savage

Springfield: W. F. Houlihan, Jr.

Toronto: R. J. Hall, J. A. Takahashi

Member-at-Large: C. H. Boenig, Trenton, N. J., G. Delaney, Bridgeport, Conn.

REINSTATEMENTS

Los Angeles: J. O. Powell, F. S. Witte

Melbourne: A. Chesterfield, R. B. Douglas, F. French, G. A. Noy, J. C. Parkin, J. M. Reid

Member-at-Large: F. A. Palma G., Mexico, D. F.; A. S. Santiago, Bangalore, India

TRANSFERS

Chicago: D. H. Morris, from Syracuse, P. Stevens, from New York

Cleveland: J. A. Henricks, to Indianapolis

Detroit: T. F. Stapleton, to Indianapolis

Milwaukee: P. Beardsley, from Saginaw Valley

Montreal: J. D. Fairbairn, to New Haven

RESIGNATIONS

Cleveland: F. T. Buescher

Columbus: R. Keene

Montreal: G. O. Palmer

Springfield: D. J. Clini, H. S. Cummings

Toledo: J. Manges, H. Whitaker

SUSPENSIONS

Los Angeles: G. R. Bouffard, K. W. Clayton, A. Crum, R. V. Eston, H. Rubin

New York: H. Banks, H. Bardong, J. Beller, N. Feldman, F. Friedman, F. Galoway, S. Gewertz, R. Kaplan, R. Knopf, E. Laddamada, S. A. Lewis, B. Lovelock, D. Manley, S. Ratoff, J. Restivo, S. Rosenblatt, A. Schiavo, H. Schneider, T. Sullivan

Rochester: R. J. Eastland, P. Paanak, M. Ottenschot

Seattle Puget Sound: C. C. Deardorff, A. MacRae, D. S. Minor, E. Sesenden

Toledo: F. Barrett, J. Goldsworthy, R. Volk

DEATHS

Chicago: B. B. Belke

And you can put a lot of metal work through a cleaning tank charged with

Cowles NS SOAK CLEANER

because Cowles NS Soak Cleaner has *extra soil capacity.* Cowles NS Soak Cleaner gives you *more emulsifying* action—*more power* to hold loosened soil in suspension long after ordinary soak cleaners have broken down.

No scum on the cleaning tank to foul cleaned metal coming out. Clean it with Cowles NS Soak Cleaner and it stays clean. Your tanks stay clean, too. No sludge build-up.

For tips on *soak tank* cleaning before plating, enameling, other finishing—

Send this coupon for NS Technical Bulletin

Cowles Chemical Company
7018 Euclid Avenue
Cleveland 3, Ohio
Please send Cowles NS Bulletin
Name_____
Company_____
Address_____
City_____ State_____

Cowles CHEMICAL COMPANY
Cleveland 3, Ohio

See Cowles' other advertisements on pages 1127 and 1159

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MICCROSOL SPRAY S-2003 IS READY . . . to show YOU the way to profitable spray jobs

You can apply S-2003 with conventional spray equipment.

You can apply 60 mils thickness in one application without sagging of material. If multiple coats are required, a short cure time is all that's needed between applications. A contrasting color can serve for layer identification, if desired.

You can use S-2003 in all plating baths. It has the same toughness—chemical, corrosion, and abrasion resistance as Miccrosol E-1003. Our adhesive systems provide outstanding adhesion to metal surfaces.

Tanks
Ducts
and other
Equipment

Solvent additives are not necessary. S-2003 is 100% solids and is sprayed as received. Time consuming and expensive adjustments are unnecessary. Problems of material instability and film cracking are eliminated. There is no solvent loss and less operator fatigue with Miccrosol Spray S-2003.

It's the ideal plastisol for spray applications.

IT'S TOPS!

• *WRITE FOR PARTICULARS ON COMPANY LETTERHEAD*

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MICHIGAN CHROME *and Chemical Company*

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BRANCH NEWS

MELBOURNE

Tikotin Speaks on Metal Rectifiers

President **H. Littauer** opened the meeting at 8 P.M. after a short film session. He then introduced **P. Tikotin** who delivered an address on "Metal Rectifiers." Numerous slides of various installations with capacities up to 50,000 amps were shown. A lively discussion period followed. **J. Christian** moved that a vote of thanks be extended the speaker and this was carried by acclamation.

MILWAUKEE

Final Meeting of the 1955-56 Season

On June 1, 1956 the Milwaukee branch of the AES held its 6th annual Pabst Blue Ribbon meeting. This meeting is one of the highlights of the season and at least 120 members eagerly filed through the doors of the Pabst Blue Ribbon Hall to register for the dinner meeting.

Milwaukee Branch at its Sixth Annual Pabst Blue Ribbon Meeting

Members quickly gathered into the hall where groups discussed sense and nonsense while being served beer and cheese puffs by the Pabst Blue Ribbon Maids. The extroverts in the group formed choral circles and sang songs to the accompaniment of Shirley and her accordion.

Herman Tessman (right) presenting Nick Servatius with honorary membership certificate in the Milwaukee Branch of the AES

The camaraderie was interrupted by the announcement that food was being served, whereupon the members settled down to enjoying an excellent buffet supper.

With their appetites satisfied, the members were prepared to enjoy the premier showing of a nontechnical color movie, "Adventure In Africa," with narration by **Murl Duesing,** curator of education at the Milwaukee Public Museum. Murl Duesing is famous for his expeditions to Africa and this particular film was produced at great expense for NBC's Zoo Parade.

The regular order of business was then commenced at which time the following officers for the 1956-57 season were installed: President, **Herman Tessman;** 1st Vice-President, **E. H. McCoy;** 2nd

SPEED UP PRODUCTION with DOUBLE-ACTION DRYING

Air-dry as you spin-dry with the new, improved New Holland Model 20 KREIDER CENTRIFUGAL DRYER

• Now you can *spin-dry* small parts in continuous *fresh air* in as little as 15 seconds.

Double-action drying with peak-efficiency evaporation gives smooth moisture-free surfaces . . . reduces your finishing problems by eliminating the scarring frequently responsible for costly "rejects."

Your operators will be able to boost production, cut costs way down when you install New Holland's easy-to-run Model 20 Kreider Centrifugal Dryer.

SAFER because of Mechanical and Electrical Control Features!

To unlock cover and remove basket, operator must depress foot brake, stop spinner.

Machine cannot start with open cover. Ample clearance allowed for quick loading.

To start spinner, operator must first close cover completely.

SPECIFICATIONS:
1 h. p. motor—220, 440, 550 volts—2- or 3-phase—spins 75-lb. loads at 825 r.p.m. . . . Quiet V-belt drive . . . 30-blade suction turbine draws air through spinner . . . . Arc-welded steel-plate construction . . . Heavy-gauge woven steel mesh basket . . . Weight: 490 lbs. . . . Floor space: Just under 5 sq. ft. . . . Meets N.F.C. specs. **Optional:** J.I.C. Control: Mounted on right, left side or wall. 160° supplementary heat: 2350-watt Chromalox, or steam.

Send for illustrated 4-page folder. Address Dept. P-96 New Holland Machine Company, New Holland, Pa.

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TAPES that keep plating where you want it!

No matter what the plating . . . no matter how complex or irregular the object . . . there is a "SCOTCH" Brand tape to stop off —positively, cleanly, economically. For instance, No. 470 electroplating tape is strong and conformable; resists the effects of most cleaning and plating cycles . . . is a general "all-around" masking tape for plating. No. 850 Polyester Film tape is very thin and tough; has a transparent backing; is excellent for use on flat or simple curved surfaces; has greater resistance to plating cycle. Where a "thieving" action is desired, No. 420 Lead Foil tape is recommended. For complete information, ask your "SCOTCH" Brand Tape distributor, or write 3M Co., Dept. LF-96

ELECTROPLATING TAPES . . . *three of more than 300 pressure-sensitive tapes for industry trademarked . . .*

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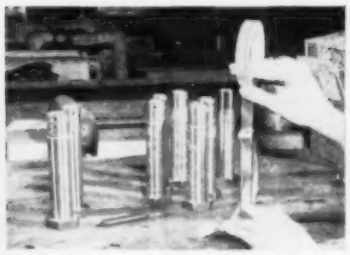
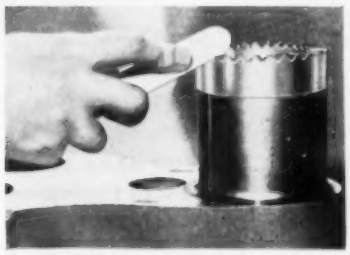
Look what you can do with them!

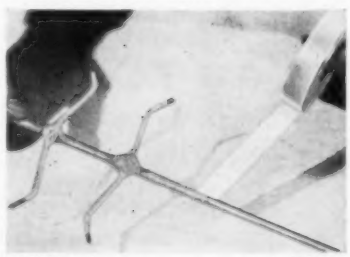
IRREGULAR shapes are easily masked prior to plating with "SCOTCH" Brand Plastic Tape No. 470. Tough, conformable tape follows all contours; safely seals off any area.



THINNESS of "SCOTCH" No. 850 Polyester Tape prevents edge build-up when used to mask bearing surfaces before plating.



ELIMINATE slow, costly wiring of lead sheets onto areas to be masked by using "SCOTCH" Brand Tape No. 420. Tape itself is lead foil with pressure-sensitive adhesive.



SAVE solutions . . . prevent build-up on racks by covering racks with heavy-duty "SCOTCH" Brand Plastic Tape No. 470. All "SCOTCH" Brand Tapes apply easily from roll.

Officers and honorary members: (left to right) Fred Anderson, Board of Managers; Leslie Diveley, Librarian and Program Director; Phil Ritzenthaler, Board of Managers; Henry Bomitzke, Honorary Member; Mike Servatius, Honorary Member; E. H. McCoy, 1st Vice-President; Gordon Einberger, 2nd Vice-President; Herman Tessman, President; and S. Taterzynski, Secretary-Treasurer

Vice-President, **G. Einberger**; Secretary-Treasurer, **S. Taterzynski**; Librarian, **L. Diveley**; Board of Managers, **G. Schwemer**; Assistant Librarian, **E. Pielluseh.**

Two members, **Henry Bornitzke** and **Nick Servatius,** were emotionally moved when they were presented with Honorary Memberships in the Milwaukee branch for outstanding contributions to the Society.

Ritzenthaler (right) presenting Bomitzke with an honorary membership certificate in the Milwaukee Branch of the AES

The pride and enthusiasm of the branch in conferring this honor was reflected by a standing ovation of the members present.

As a fitting climax to an outstanding meeting, Henry Bornitzke presented a paper on the "History of the Milwaukee Branch of the AES," compiled from records of the branch and information given by members who are living and attended the first meetings.

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Secretary-Treasurer

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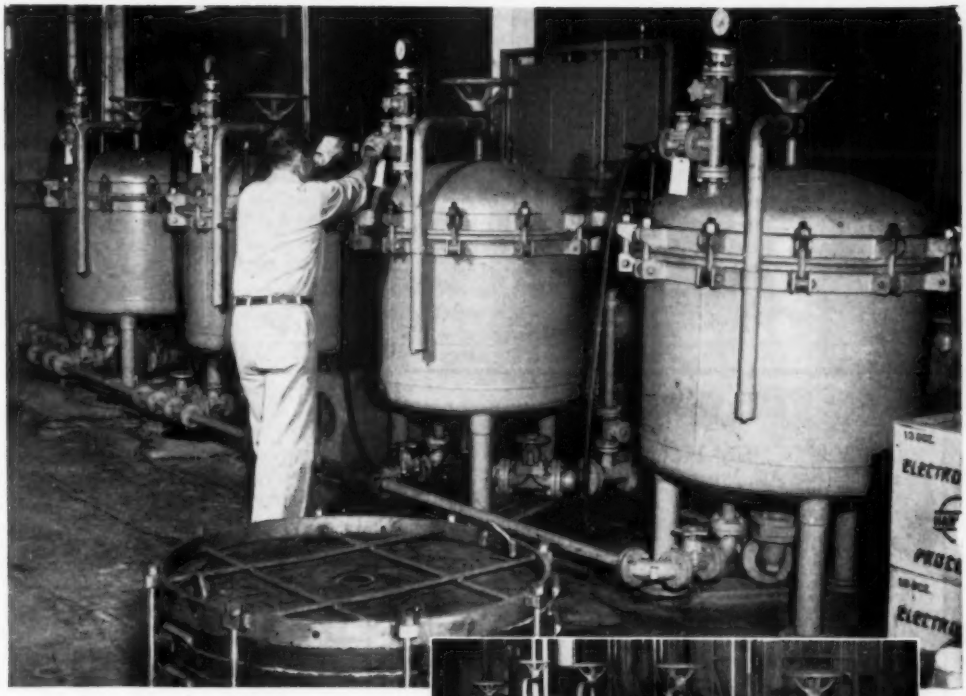

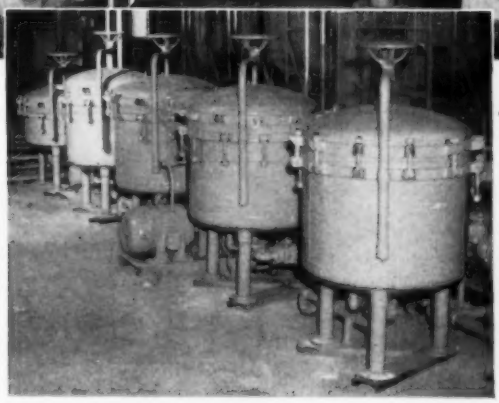

High Flow Rates Low Servicing Cost *gives* Low Cost Filtering of Plating Solutions–

2,208,000 gals. of bright nickel solution are filtered in these four Sparkler Horizontal Plate filters (top illust.) through a continuous 5 day cycle with 24 hour operation. Filters are cleaned once a week by lifting out the plate cartridge and replacing it with a fresh dressed set of plates. Only a few minutes is required for this operation.

In the same plating plant, (lower illust.) the four large Sparkler filters are used to filter suspended matter from Ronal bright copper solution. These filters have a flow capacity of 4800 G.P.H. each. The small, far end unit filters suspended matter from a copper strike bath. Capacity 2,100 G.P.H.

On occasion these filters are employed for filtering out activated carbon and lime from copper solution and activated carbon and nickel carbonates from nickel solution.

Plating Plant Engineers will find Sparkler filtration engineers most co-operative to work with on installations of any size.
Write Eric Anderson

SPARKLER
horizontal plate
FILTERS
(the original horizontal plate filter)

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Sparkler International Ltd.
Manufacturing plants in Canada, Holland, Italy, and Australia.

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BRANCH NEWS

MONTREAL

No Speaker During Final Meeting

The meeting was held in the Mount Royal Hotel on June 5 with President **Phil Coady** presiding.

A report by Convention Chairman **Ross Davidson** included the information that Vice-Chairman **D. Fairburn** had been succeeded by **C. Douglas.**

A token of appreciation for his untiring effort on the membership drive last year was presented to **Jos. Carriere** by **J. T. Reisenburg, Sr.**

A motion was made by **J. T. Reisenburg, Jr.** and seconded by **N. Cronin.** It was decided that the September meeting be held on the second Monday, September 10—the first Monday being Labor Day, and that henceforth all monthly meetings be held on the first Monday of each month unless that Monday happens to be a holiday in which case it will be held on the second Monday.

A tribute of silence was paid to deceased member **J. J. Roche.**

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1955-1956

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1-1500/750 " 6/12 " —Motor Generator Corp.
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1-Torit Model 19 FB—2 HP Motor

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"The course I took with you had a great deal to do with my being able to obtain a job in supervision in this large company. I value the lesson material very much. We have a large vault with a combination known only to me and higher supervision; it is there I keep the books you wrote—alongside the silver and gold!" writes the plating foreman* for an outstanding instrument company. You too, will find silver and gold in this fabulous course in modern electroplating. Investigate! **Joseph B. Kushner, Electroplating School, Stroudsburg 10P, Pa.**

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For Metal Finishers!

Pressure Moulded NEOPRENE **"CAPLUGS"**

7 STANDARD SIZES

	A	B	C	D	E	F	G
TO PLUG HOLE SIZE	1/8-3/16	3/16-1/4	1/4-5/16	5/16-1/2	1/2-5/8	9/16-11/16	5/8-3/4
TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	5/16-3/8	3/8-7/16	5/16-1/2

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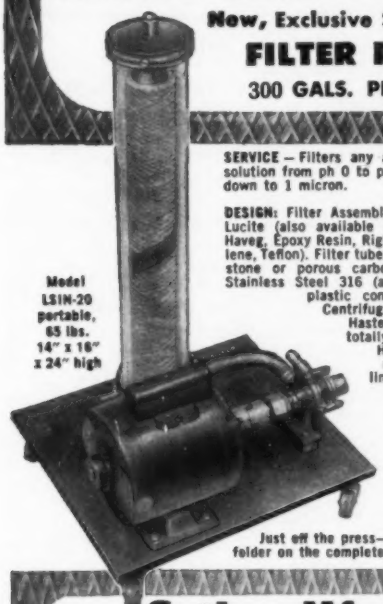
FILTER with a Sethco

Now, Exclusive Self-Priming

FILTER PUMP

300 GALS. PER HOUR



Model LSIN-20 portable, 65 lbs. 14" x 16" x 24" high

SERVICE — Filters any acid or alkaline plating solution from ph 0 to ph 14. Removes particles down to 1 micron.

DESIGN: Filter Assembly as illustrated in H.T. Lucite (also available in Stainless Steel 316, Haveg, Epoxy Resin, Rigid Vinyl, Saran, Polyethylene, Teflon). Filter tubes of cotton, dynel, porous stone or porous carbon. PUMP: Self-priming, Stainless Steel 316 (also available in an all plastic construction). Available as Centrifugal in Stainless Steel or Hasteloy. Motor is ¼ H.P., totally enclosed Ball Bearing. HOSE: acid and alkaline resistant. Base Platform: linen-impregnated phenolic laminate on rubber tire, ball bearing casters.

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Just off the press—write for illustrated fact-folder on the complete line of filters by Sethco.

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Nickel anodes up to 93 inches in length —cast in new shell mold process. This unique method of casting produces anodes of the highest purity—with optimum metallurgical properties. Density of anodes is at a maximum and excellent surface is obtained. These factors account for longer life in plating bath.

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ANY QUANTITY only 99+ purity accepted

15c PER POUND

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Laboratory Controlled

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Copper-Electro Deposited	Phos. Copper
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BRANCH DIRECTOY

ADELAIDE meets last Friday of each month at 17 Waymouth Street, Adelaide. Secretary-treasurer, R. J. Down, 17 Currie Street, Adelaide, S.A., Australia.

ALLENTOWN-READING meets fourth Thursday of each month at 7:00 P.M. in Scotty's Anchorage, Second and Main Streets, Emmaus, Pa. Secretary-treasurer, R. Housel, c/o Heat Treating Dept., Ingersol Rand Co., Phillipsburg, N. J.

BALTIMORE-WASHINGTON meets second Tuesday of each month at 8:00 P.M. at Chemistry Bldg., National Bureau of Standards and Marling House, 20 East Fayette Street, Baltimore, Md. Secretary, Carl H. Thiede, 8426 Piney Branch Road, Silver Spring, Md.

BOSTON meets first Thursday of each month at 6:00 P.M. at the Hotel Statler, Boston, Mass. Secretary-treasurer, Dr. George P. Swift, 53 Galen Street, Watertown, Mass. Research finance committee chairman, Louis V. Gagnon, P.O. Box 329, Framingham, Mass.

BRIDGEPORT meets second Friday of each month at 8:00 P.M. at the Hotel Barnum, Bridgeport, Conn. Secretary-treasurer, R. G. Parker, 25 Beverly Road, Trumbull, Conn.

BUFFALO meets first Friday of each month at 6:30 P.M. at the Markeen Hotel. Secretary, Fred Goeckel, 139 Overbrook, Tonawanda, N. Y.

CAPITOL DISTRICT meets first Monday of each month at 8:00 P.M. at Panetta's Restaurant, Menands, N. Y. Secretary, E. V. Raymond, Broadlawn North Street, Cheshire, Mass. Research finance committee chairman, C. R. Klimek, 16 Southern Avenue, Pittsfield, Mass.

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LATEST ADVANCEMENT IN ZINC BRIGHTENING AGENTS!

BRIGHT Even at extremely high current density ranges the effectiveness of Z-B-2 is not lowered. It *stays* bright!

STABLE Z-B-2 is stable in plating solutions of ANY current density . . . . even at extremely high operational temperatures, and during "down" periods!

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BRILLIANT PROMAT'S latest advancement in zinc brighteners gives a beautiful, lasting, decorative finish that cannot be duplicated!

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BRANCH DIRECTORY

CENTRAL MICHIGAN meets second Tuesday of each month at 7:00 P.M. alternating between Porter Hotel, Lansing and Hayes Hotel, Jackson, Michigan. Secretary-treasurer, E. J. Bosca, 411 Third St., Jackson, Mich. Research finance committee chairman, Dr. C. F. Gurnham, Michigan State College, Dept. of Chemical Engineering, East Lansing, Mich.

CHICAGO meets second Friday of each month at 7:00 P.M. at the Western Society of Engineers. Secretary-treasurer, P. Glab, 882 N. Paulina St., Chicago, Ill.

CINCINNATI meets fourth Wednesday of each month at 6:30 P.M. at Engineering Society Headquarters, McMillan at Woodburn, Cincinnati, Ohio. Secretary, D. L. Kaplan, 6227 Stover Ave., Cincinnati 13, Ohio.

CLEVELAND meets first Friday of each month at 8:00 P.M. at the Hotel Carter. Secretary-treasurer, R. I. Peters, 12901 Elmwood Ave., Cleveland 11, Ohio. Research finance committee chairman, E. J. Roehl, 107 East 202nd St., Euclid 23, Ohio.

COLUMBUS meets first Friday of each month at 8:00 P.M. at Battelle Memorial Institute, Columbus, Ohio. Secretary, H. Christianson, 2593 Andover Rd., Columbus 21, Ohio.

DALLAS-FORT WORTH meets third Wednesday of each month at 6:30 P.M. at the Lennox Hotel, Grand Prairie, Texas. Secretary-treasurer, A. C. Fricke, 212 Julian St., Dallas, Texas. Research finance committee chairman, A. C. Fricke.

DAYTON meets third Wednesday of each month at 8:00 P.M. at the Hotel Biltmore, Dayton, Ohio. Secretary, R. M. Clinehens, 3206 Harwood St., Dayton 10, Ohio.

DETROIT meets first Friday of each month at 8:00 P.M. at the Sheraton-Cadillac Hotel, Detroit. Secretary-treasurer, E. J. Kubis, Wyandotte Chemicals Corp., Wyandotte, Mich. Research finance committee chairman, G. H. Friedt, Jr., 3456 Denton Ave., Detroit 11, Mich.

GRAND RAPIDS meets second Friday of each month at 7:00 P.M. at Fingers Restaurant. Secretary, D. Smith, 1825 Martin, S.E., Grand Rapids, Mich. Research finance committee chairman, R. Watson, 3045 Kalamazoo, S.E., Mich.

HAMILTON meets third Friday of each month at 8:00 P.M. at Fishers Hotel, Hamilton, Ontario, Canada. Secretary, N. A. Graham, Stoney Creek, P.O., Hamilton, Ontario, Canada. Research finance committee chairman, W. G. Finlay, 7 Hill St., Hamilton, Ontario, Canada.

HARTFORD meets third Monday of each month at 7:45 P.M. at the Hotel Bond, Hartford, Conn. Secretary, S. Platoz, 26 Erwin Place, New Britain, Conn. Research finance committee chairman, F. Smith, Derby Milford Rd., RFD No. 1, Orange, Conn.

HOUSTON meets third Tuesday of each month at 7:00 P.M. at the Ben Milan Hotel, Houston, Texas. Secretary-treasurer, R. A. Marz, 2903 West Dallas, Houston, Texas.

INDIANAPOLIS meets first Wednesday of each month at 6:30 P.M. at the Fox Steak House, 1207 E. Washington St., Indianapolis, Ind. Secretary, Edna Rohrabaugh, 1300 Burroughs St., Lafayette, Ind.

KANSAS CITY meets second Thursday of each month at the Berkshire Hotel. Secretary, Olin Bock, Turco Products, Inc., 2112 Grand Ave., Kansas City, Mo.

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COPPER CORE ANODES

World's Finest Chrome Plating Anodes

The same plater who recently gave us this order for 266 Copper Core Anodes has ordered a total of 400 so far this year. But this is typical of the keen reception these anodes have had with chrome platers, in both custom and company shops. Here are some of the reasons for their growing popularity:

The Copper Core is homogeneously bonded to the lead for its entire length. The hook is lead covered for additional protection.

This remarkable anode will conduct 250 amperes based on copper area alone. Natural current flow makes the entire surface self-cleaning—insuring complete saturation, instant current distribution, and unusual throwing power. This greatly reduces plating time for a given thickness of deposit.

The Copper Core distributes the current equally throughout the length of the anode. As this anode is insulated above and below the solution level, there is no flow of heavy surface currents nor burning off at solution line. Conductivity is uniform at all solution levels, regulated only by the cathode depth.

Because of the perfect contact maintained by a one-piece copper hook, Copper Core Anodes will not heat at point of contact, and there are no current failures to solution. Also, Copper Core Anodes do not warp out of shape.

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PITTSBURGH meets first Wednesday of each month at the Sherwyn Hotel at 8:00 P.M. Secretary, F. W. Stevens, 79 Summit Ave., Ellwood City, Pa. Research finance committee chairman, M. Ceresa, 207 Highland Rd., Pittsburgh, Pa.

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SOUTHERN TIER meets third Tuesday of each month at 7:30 P.M. alternating between Ah-Wa-Ga Hotel, Owego and Iron Kettle Inn, Waverly. Secretary-treasurer, R. Wheeler, Box 48, Killawog, N. Y. Research finance committee chairman, E. Szymaniak, 118 Downs Ave., Johnson City, N. Y.

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SYRACUSE meets third Monday of each month at 6:30 P.M. at the Citizens Club, 282 James St., Syracuse, N. Y. Secretary, M. F. Stevenson, 313 Beech St., North Syracuse 12, N. Y. Research finance committee chairman, K. S. Parnell, 829 Maryland Ave., Syracuse, N. Y.

TOLEDO meets first Thursday of each month at 6:30 P.M. at Angelo's Spaghetti House, Stickney Ave., Toledo, Ohio. Secretary-treasurer, G. H. Bergeman, 703 Pine St., Fremont, Ohio.

TORONTO meets second Friday of each month at 6:30 P.M. at the Royal York Hotel, Toronto, Canada. Secretary-treasurer, E. F. Hutt, 19 Aneta Circle, Willowdale, Ontario, Canada. Research finance committee chairman, K. Wells, 1156 Birchmount Rd., Scarboro, Ontario.

TWIN CITY meets first Monday of each month at 7:00 P.M. at Jax Cafe. Secretary-treasurer, R. L. Buckley, 205 11th Ave., So., Minneapolis, Minn.

WATERBURY meets second Thursday of each month at 6:00 P.M. at the Colonial Room of the Hotel Elton, Waterbury, Conn. Secretary-treasurer, A. G. Griffith, 94 Ridgeview Place, Cheshire, Conn. Research finance committee chairman, F. X. Bergin, 25 Steuben St., Waterbury, Conn.

WESTERN ONTARIO meets third Friday at 7:00 P.M. at the Wm. Pitt Hotel, Chatham, Ontario. Secretary-treasurer, D. R. Mainland, 21 Maple St., Chatham, Ont. Research finance committee chairman, P. Croly, Ontario Steel Products, Co., Ltd., Chatham, Ontario.

WICHITA meets fourth Wednesday of each month at 6:30 P.M. Meeting place as announced. Secretary, G. Summers, 1422 S. Martinson, Wichita, Kansas.

FUTURE MEETINGS

AES

September 28—Editorial Board Meeting, National Headquarters, Newark, N.J.

October 17—Research Committee Meeting, National Headquarters, Newark, N.J.

June 17-20, 1957—44th Annual Convention of the AES, Sheridan-Mt. Royal Hotel, Montreal, Canada.

May 19-22, 1958—45th Annual Convention of the AES, Sheraton-Gibson Hotel, Cincinnati, Ohio.

INTERSOCIETY

September 10-12—ASME Fall Meeting, Denver, Colorado.

September 16-21—Annual Meeting, American Chemical Society, Convention Hall, Atlantic City, N.J.

September 16-22—2nd ASTM Pacific Area National Meeting, Hotel Statler, Los Angeles, California.

September 17-21—ASME & Instrument Society of America, exhibit and joint conference, N. Y.

September 25-27—1956 Trade Fair of the Atomic Industry, Navy Pier, Chicago.

October 8-12—National Metal Congress and Exposition, American Society for Metals, Public Auditorium, Cleveland, Ohio.

October 21-24—34th Annual Meeting and 21st Paint Industries Show, Federation of Paint and Varnish Production, Netherlands Plaza Hotel, Cincinnati, Ohio.

October 28-November 1—Fall Meeting, Electrochemical Society, Inc., Hotel Statler, Cleveland, Ohio.

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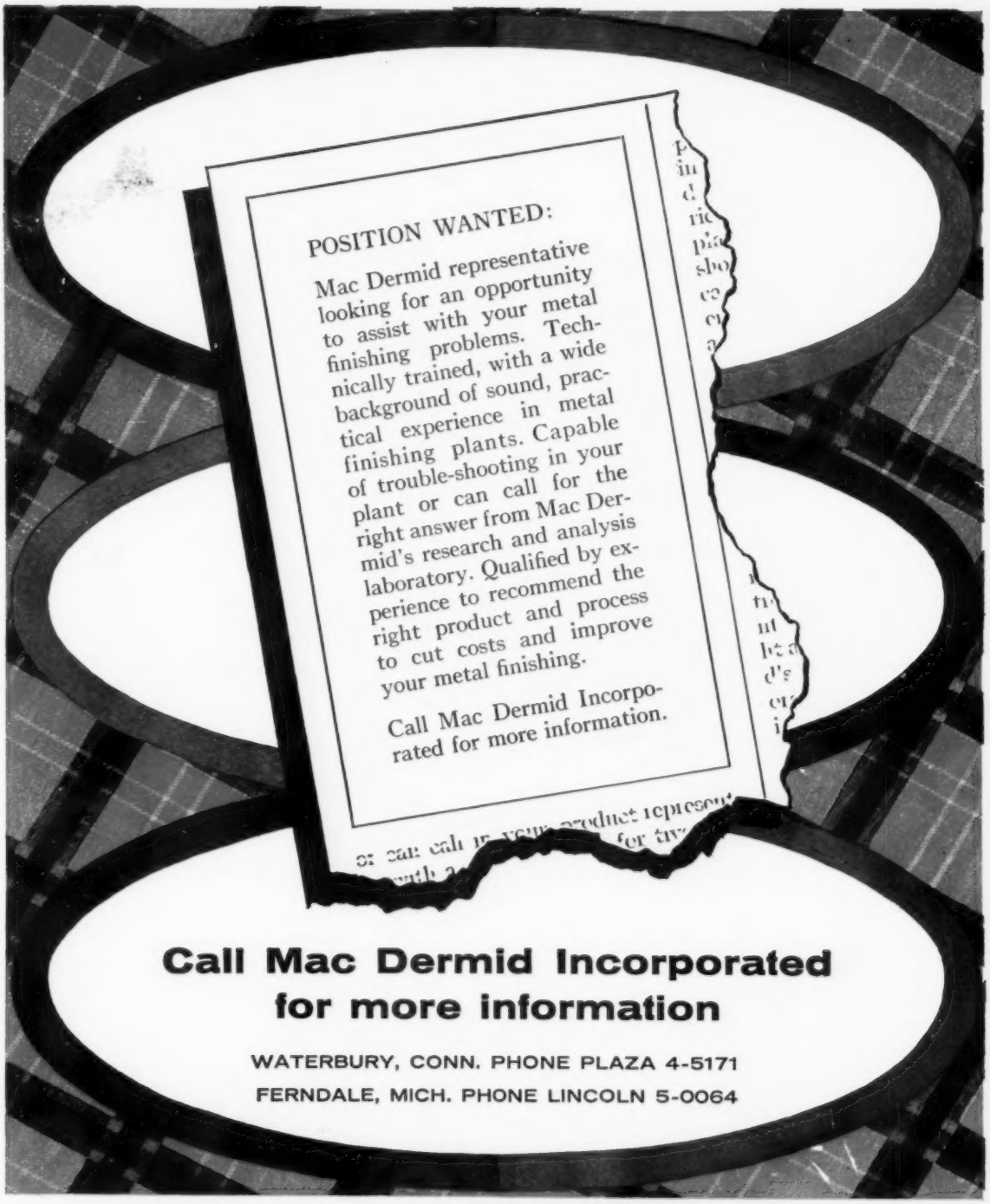
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